THE UNIVERSITY OF ALBERTA

PROFESSIONAL ENGINEERS IN ALBERTA TECHNICAL EDUCATION

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Professional Engineers in Alberta Technical Education," submitted by Frederick Williamson in partial fulfillment of the requirements for the degree of Master of Education.

ABSTRACT

The purpose of this study was to describe selected personal, educational and professional characteristics of the staff in the two Alberta Institutes of Technology with professional engineering backgrounds.

A 60-item questionnaire was developed, and administered to the defined population of 141 staff employed at several organizational levels. Completed and returned questionnaires numbered 108, representing 76.6 per cent response. Over two thirds of respondents were line instructors, with the remainder in instructional-administrative or administrative ranks.

All respondents were male. Approximately four-fifths were younger than 45 years of age, with the group median 34.5 years.

The extent of institute service ranged up to 19 years, with median service 4.6 years.

Professional status was achieved by university graduation by 89 per cent of respondents, with approximately one-fourth of the university graduates having proceeded to a graduate engineering degree. Two-thirds of the university graduates reported that their post-secondary education was wholly or primarily in Alberta.

Although almost all respondents perceived their education to be at least adequate for the performance of their institute duties, almost one-third were currently enrolled in formal educational upgrading activities, half of which were associated with graduate engineering study. Almost one-fifth of the staff had been granted educational leave to assist their educational upgrading.

The majority of staff had never held an Alberta Teaching Certificate, although some type of teaching experience prior to institute employment was reported by 37 per cent of respondents.

Professional engineering experience prior to institute employment ranged up to 36 years, with a median of 2.7 years. Almost one-third of the respondents reported that their prior professional engineering activity was primarily in the governmental sector of endeavor, with two-thirds of staff indicating that such experience was wholly or primarily in Alberta.

The extent to which staff had maintained professional engineering contact since institute employment was indicated by activity in professional associations and extra-institute professional engineering employment.

Current membership in the Association of Professional Engineers of Alberta was reported by 89 per cent of respondents. Beyond such nominal association involvement, however, rather limited activity was indicated by responses describing service as elected association officers, committee membership and attendance at association meetings.

Almost four-fifths of the staff reported that they had no extra-institute professional engineering employment activity during the year of this study, although one-half believed that they could easily make the transition from the institutes into industry.

Two-thirds of respondents perceived industrial leave as more valuable than educational leave, for purposes of staff development; the former mechanism had, however, been used by only four respondents.

Three-fourths of the staff reported that they were satisfied or fairly well satisfied with their institute teaching function and 93 per cent expressed the wish to remain in post-secondary education activities.

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GLOSSARY OF TERMS AND ABBREVIATIONS USED THROUGHOUT THIS THESIS

A.P.E.A.	Association of Professional Engineers of Alberta (also called the "Association")
C.A.A.T.	College of Applied Art and Technology
f	frequency
n	number
N.A.I.T.	Northern Alberta Institute of Technology
P. Eng.	Professional Engineer
S.A.I.T.	Southern Alberta Institute of Technology

CHAPTER 1

INTRODUCTION, STATEMENT OF THE PROBLEM AND ITS SIGNIFICANCE

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1.1 Introduction

The development of post-secondary non-university education programs and facilities was rapid in Canada during the decade of the sixties. Little precedent was available to guide such development, except for limited awareness of the European polytechnic and American college systems.

Provincially, emergence of a triple system of post-secondary non-university education occurred, consisting of the public community colleges, agricultural-vocational colleges and the technical institutes. While each component of the system experienced unique developmental difficulties, some common distress also occurred, relating to institutional role and philosophy, educational and geographic jurisdiction, program offerings, staffing, and a spectrum of organizational difficulties relating to finance and governance. The last several years have seen the formation of an increasingly introspective posture within the institutions and the system with accelerated activities of

institutional examination and research. These activities span aspects of staff, students, plant, program, manpower requirements and articulation within the system.

1.2 Statement of the Purpose of the Study

The relative importance of the many resources devoted to the educational process is a subject for conjecture, although there appears to be little doubt that the individual and collective abilities of the instructional staff are critical components of the complex educational process.

The combination of characteristics contributing to "good" instructional staff is subtle, incorporating personal aspects of motivation, ambition, diligence and role expectation to more readily characterized demographic, educational and industrial facets. Except in the broadest qualitative terms, there has been no definition of desirable staff characteristics.

As a preliminary study in description of instructional staff in Alberta technical education at the post-secondary level, this investigation was designed to describe selected personal, educational and professional characteristics of the technical institute staff with professional engineering backgrounds.

The engineering orientation of many programs at the institutes of technology has resulted in extensive staffing by personnel whose education and industrial experience were in professional engineering. Even superficial examination of the history, present role and organization of the institutes indicates the extent to which their development is influenced by this staff group.

Acknowledgement of the presence, role and contributions of professional engineering staff in Alberta institutes and descriptions of some of their primary personal, educational and industrial characteristics are expected to yield some measure of staff "quality" with implications resultant for staff recruitment, selection, professional development and organizational re-definition.

CHAPTER 2

REVIEW OF LITERATURE

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REVIEW OF LITERATURE

Limited literature exists to describe college/technical institute instructional staff in the North American setting, with primary emphasis on the academic preparation and credentials of this group.

Despite the limited literature, Stewart (1966) indicated the need to characterize staff in post-secondary non-university institutions since he expected such a group to exhibit rather unique staff profiles.

In an early study, Proctor (1927) reported academic credentials of junior college instructional staff as comprised of seven per cent doctoral, 40 per cent at the master's level with teaching certification, 36 per cent with baccalaureate degrees and teaching certifications, and 17 per cent lacking degrees. A later study of Sexson and Harbeson (1946) showed the increasing proportion of staff with advanced degrees. Sexson and Harbeson (1946) viewed requirements at the college level as a minimum academic preparation of a master's degree, while also emphasizing the need for previous related experience.

Other recent studies of Medsker (1960) and Mayhew (1962) emphasized the level of required academic preparation for college instructional staff. Medsker (1960) cited junior college data which indicated that 93 per cent of instructional staff in these institutions held at least a bachelor's degree, 64 per cent possessed a master's degree, and almost 10 per cent an earned doctorate.

Levels of academic preparation of college staff were reported by Mayhew (1962) who found in 1962 that in private liberal arts colleges more than 25 per cent of staff had earned doctorates, while in all colleges studied almost 40 per cent had doctorates. Mayhew generalized that the doctorate was rapidly becoming accepted as the appropriate preparation for a college instructor.

Little explicit reference to aspects of staff preparation other than education appears in the literature, although Richardson and Blocker (1968) note that ". . . directly applicable experience is often preferred to an academic background" for a college instructor, with the implication that subject competence is the most critical aspect of staff background.

Treating the subject of community college faculty Leach (1968) cited findings related to projected demands and expected characteristics. By quoting Medsker (1960) and Siehr (1963), Leach showed that the proportion of college staff with master's degrees increased from 64 to 73 per cent in the pèriod 1960 to 1963. Conversely, staff with earned doctorates were found to drop from 9.7 to 7.2 per cent. In a 1968 study, Reitan and Leach (1968) revealed that among new academic instructors in the college system of the state of Washington, 74 per cent had earned master's degrees and 4.2 per cent earned doctorates. Among new vocational instructors in the college system, however, it was observed that 48 per cent had achieved less than a bachelor's degree. They cited more recent data to indicate that staff with bachelor's, master's and doctoral degrees were 35, 12 and 3.3 per cent in the vocational portion of the college system.

The unique teacher requirements of technical-vocational programs at the secondary and post-secondary levels were stated qualitatively by Bolin (1967) and Dobrovolny (1967). Bolin (1967) described desirable staff characteristics for such programs as:

a) industrial experience in a speciality,
b) ability to teach across subject lines,
c) maintained industrial contact, and
d) varied formal educational requirements.

While Bolin (1967) only implied the priority of these staff characteristics, Dobrovolny (1967) explicitly described their relative importance in the technical education spectrum of business-related, health-related, agriculture-related and engineering-related activities at the post-secondary non-university level. He defined the threshold of educational attainment to be the post-baccalaureate certificate (post-engineer's degree by 32 credit hours), and ranked prerequisite characteristics as:

1. subject matter competency
2. industrial experience, and
3. pedagogic ability

Weatherly (1967) noted a similar priority, by stating the opinion that education and industrial experience were staff characteristics more important than pedagogic training.

Fisher (1970) quoted Jarvie (1956), who viewed junior college instructor prerequisites as:

1. six years of college education beyond high school,
2. a master's degree in a subject field,
3. one-sixth of the total program designed for preparation for junior college teaching, including

3.1 work organized to include thorough preparation in the basic factors of teaching competence,
3.2 a thorough knowledge of the characteristics of junior college students,
3.3 work organized to develop attitudes, skills and knowledges necessary to fulfill the functions of the junior college,
3.4 work emphasizing means of adapting methods of instruction and subject matter presentation to meet the needs of junior college students,
3.5 field work in a typical junior college organized as an integral part of each of the courses used in fulfilling the requirements in professional education, and illustrating the practical applications of the theory contained in the courses,
3.6 an internship of directed teaching and related activities of at least one semester in an approved program in a typical junior college teaching situation,

4. work experience in a field related to the major subject; the duration of related work experience is to be longer than three months for teachers of transfer students and a year or longer for teachers of terminal students.

Other quantitative reference to the extent of industrial experience is limited. Roney (1965) cited state requirements for secondary and post-secondary technical teachers as typically five years industrial experience. Graney (1964) quoted findings of Henninger (1959) pertaining to technical institute staff academic preparation and industrial experience.

Slightly more than one-half the institutions studied by Henninger reported that instructional staff possessed an average academic attainment of a master's degree; 35 per cent reported that the average attainment was a bachelor's degree, with the remainder exhibiting a lesser academic credential. Median industrial experience reported by Henninger was between six and seven years.

The definitive work relating to characteristics of staff in post-secondary, non-university Alberta institutions was completed in 1969 by Tod (1969), who investigated broad aspects of personal, educational and industrial characteristics of staff in ten Alberta institutions. Although the institutions studied were diverse, Tod reported data separately for the agricultural-vocational colleges, junior colleges and technical institutes. Some of his data showed that for technical institute staff:

a) almost three-fourths of respondents did not possess a teaching certificate,

b) barely one-half the respondents had a baccalaureate degree or equivalent, and 11.4 per cent possessed academic credentials in excess of a master's degree,

c) 57.7 per cent were not pursuing additional academic, professional, technical or trade credentials,

d) 73.8 per cent had proceeded to the institute directly from a non-educational facility, and

e) more than one-half the respondents reported that they possessed over ten years of full-time employment outside educational institutions, when they joined the institute staff.

Watson (1971) integrated staff data on a broad geographic scale, by reporting data from several Canadian provinces. Ontario data cited indicated that 54.3 per cent of C.A.A.T. instructional staff had been recruited directly from business and industry, suggesting innovative input into the colleges. Ontario instructors in three-year programs were reported as practically all (98 per cent) male, with 66 per cent possessing at least a baccalaureate degree. Their previous occupation was reported as "engineering and related occupations" by 37.5 per cent, with another 42.5 per cent having proceeded from teaching and related professions.

Watson (1971) reported that three-fourths of C.A.A.T. instructors were working in Ontario when recruited, while 6.7 per cent were from other Canadian

provinces, indicating that staffing was essentially a local effort, and considerably different from the staffing patterns noted in expansion of Ontario universities.

Although Alberta data cited by Watson are almost entirely those of Tod (1969), patterns of data observed by Watson were that:

a) Alberta staff were attracted from industry in about the same way as in the C.A.A.T. system,

b) there was a high incidence of formal educational upgrading in Alberta technical institutes, interpreted by Watson as due to incentives in the salary schedule, and

c) While Alberta growth has not been so rapid as in Ontario or Quebec, Watson found significance in that 42.4 per cent of Alberta technical institute staff who had been employed only one or two years at the institutes, leading her to observe: ". . . when coupled with age data, this suggests an inexperienced teacher force to a degree which had not been envisioned . . ."

CHAPTER 3

RESEARCH PROCEDURES

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RESEARCH PROCEDURES

3.1 Study Population

The population for this study consisted of full-time staff of the two Alberta institutes of technology with professional engineering backgrounds. Those studied were personnel whose credentials permitted them to register with the Association of Professional Engineers of Alberta (A.P.E.A.). To ensure that the entire population was identified, staff were viewed in two groups:

a) those staff who were currently registered with A.P.E.A., and

b) those staff who were formerly members or currently eligible for membership.

Staff in the former group were readily identified from A.P.E.A. membership registries and institute personnel records. Those in the second category were identified with greater difficulty, using a process of:

a) studying institute personnel records,

b) preparing tentative lists of staff who appeared eligible for inclusion in the study, and

c) interviewing institute department heads to verify and supplement the tentative staff lists.

The resultant study population numbered 141 (88 and 53 staff from N.A.I.T. and S.A.I.T., respectively), representing several instructional and administrative levels. The study population represented almost 22 per cent of the entire instructional group of N.A.I.T., and almost 16 per cent of the instructional group of S.A.I.T.

Although staff at two institutions were investigated, the collective staff group consisting of those with professional engineering background at both institutions was defined as the study population. Thus, staff from various organizational levels of two institutions comprised the study population, and the research questionnaire was administered to each.

Explicit in such a population definition was the intent to characterize the collective N.A.I.T.-S.A.I.T. engineering staff group, rather than attempting to describe aspects in which the N.A.I.T. and S.A.I.T. groups exhibited different characteristics.

3.2 Classification of Population by Organizational Level

Since the study attempted to investigate some characteristics of all institute staff with professional engineering backgrounds, data were obtained

from various organizational levels within the institutes. Classification of the population into instructional, junior administrative and administrative groups was considered of value, with the following definitions:

a)	instructional group	Instructor
b)	junior administrative group	Senior Instructor Section Head Department
c)	administrative group	Assistant Director Director Vice President President

Such classifications reflected factors pertaining to role definition and, more specifically, the extent of active involvement in the instructional process.

The study population of 141 is reported in Table 1.

TABLE 1

STUDY POPULATION

Group	NAIT	SAIT	Total
Instructor	53	21	74
Junior Administration	30	29	59
Senior Instructor	9	10	19
Section Head	17	12	29
Department Head	4	7	11
Administration	5	3	8
Total	88	53	141

3.3 Development and Application of Research Instrument

The sequence of steps in the development and application of the research instrument was:

Step		Date
1.	Discussion with Dr. G.L. Mowat and Dr. F. Thiemann concerning the proposed study	Nov. - Dec., 1969
2.	Preliminary contact with Dr. R.G. Fast of the Alberta Colleges Commission for the introduction of thesis proposal and endorsement of the Commission	Jan., 1970
3.	Communication of the interest of the Alberta Colleges Commission to institute Presidents and Director, Technical and Vocational Education	Jan. 27, 1970

4.	Personal contact and preliminary discussion with institute presidents	
5.	Contacts with various institute personnel, with preliminary draft of research questionnaire	Feb., 1970
6.	Questionnaire sent to institute staff, with covering letter	March, 1970
7.	Follow-up letter to staff, requesting their completion of questionnaire	May, 1970

Anonymity of respondents was ensured by enclosing a blank, self-addressed envelope with each questionnaire, into which the completed instrument could be placed for return.

3.4 Research Questionnaire

The questionnaire developed for this study (Appendix C) investigated five primary types of staff characteristics, by means of 60 questions, distributed as follows:

Part	Subject		Number of Questions
A	Position and Institute		7
B	Personal Data		4
C	Professional Affiliation, Education and Professional Experience		35
	C.1 Professional Affiliation	14	
	C.2 Education	10	
	C.3 Professional Experience	11	
D	Conditions of Employment		4
E	Professional Ambitions, Miscellaneous Aspects		10
		Total	60

Preliminary drafts of the questionnaire were reviewed by senior staff of both institutes before the instrument became finalized in the form of Appendix C.

3.5 Returns of Research Questionnaire

Of the 141 questionnaires distributed, returns to the end of April, 1970 numbered 86; the follow-up letter (Appendix D) was circulated to the population of 141, resulting in the total number of completed questionnaires reaching 108 by the end of June, 1970. In summary, returns were as follows:

TABLE 2

RETURNS OF RESEARCH QUESTIONNAIRE

Study Group	Population n	Completed n	Questionnaires % of Population
N.A.I.T.	88	68	77.5%
S.A.I.T.	53	40	75.5%
Total	141	108	76.6%

3.6 Analysis of Data

The limited quantity of data obtained and the unsophisticated statistical analysis required were conducive to computation using an electric desk calculator.

Median values and frequency distributions were most commonly calculated and reported for the obtained responses, although cumulative responses were also reported for some types of data.

CHAPTER 4

RESEARCH FINDINGS

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RESEARCH FINDINGS

Summarized in tabular and graphical form, obtained data are reported for each of the categories of (a) personal characteristics, (b) position and institute, (c) professional affiliation, education and professional experience, (d) conditions of employment, and (e) professional ambitions and miscellaneous aspects.

The entire professional engineering group of both institutes was the study population, with responses most commonly reported as frequencies and per cents. Frequency distributions of responses are most commonly reported, although cumulative values (frequencies and per cents) are also included for some responses where such data are considered to be of value.

4.1 Personal Characteristics

Fundamental personal characteristics of respondents are summarized in Tables 3 and 4.

4.1.1 Marital Status and Number of Dependents

All respondents were male, and the vast majority were married, as shown in Table 3.

TABLE 3

DISTRIBUTION OF STAFF BY MARITAL STATUS

Marital Status	Responses f	%
Married	100	92.6
Single	8	7.4
Total	108	100.0

The number of children reported by married staff is summarized in Table 4.

TABLE 4

DISTRIBUTION OF MARRIED STAFF BY NUMBER OF CHILDREN

Number of Children	Responses f	%
0	15	15.0
1	15	15.0
2	31	31.0
3	24	24.0
4	10	10.0
more than 4	5	5.0
Total	100	100.0

4.1.2 Age

Information pertaining to age distribution of staff is included in Table 5. Approximately one-half the staff were younger than 35 years of age, and approximately four-fifths younger than 45 years. The median age of the staff was 34.5 years.

Data reported by Tod (1969) for staff of technical institutes are similar to those reported in Table 5; he found that 46.9 per cent of staff were younger than 35 years of age, and 76.9 per cent were younger than 45 years of age.

TABLE 5

DISTRIBUTION OF STAFF BY AGE

Age in Years	Responses f	%	Cumulative Responses f	%
20-24	1	0.9	1	0.9
25-29	25	23.1	26	24.0
30-34	31	28.8	57	52.8
35-39	19	17.6	76	70.4
40-44	13	12.0	89	82.0
45-49	8	7.4	97	89.8
50-54	5	4.6	102	94.4
55-59	6	5.6	108	100.0
Total	108	100.0		

4.2 Institute Position and Institute Service

Data describing institute positions, staff classification and extent of institute service are shown in Tables 6, 7, 8 and 9.

4.2.1 Institute Position

Table 6 summarizes institute organizational levels in which engineering personnel were on staff. Since there were inconsistencies in organizational structure and staff titles between the two institutes subsequent analysis did not focus on individual staff levels. Differentiations were possible, however, among the instructor, junior administration and administration categories: the junior administration was defined as consisting of Senior Instructor, Section Head and Department Head Levels, with administration including Director, Vice President and President levels.

This distinction reflected role definition, extent and type of involvement in the direct aspects of instruction, and other conditions of employment.

Information in Table 6 shows that approximately two-thirds of the group were comprised of line instructors, and that only four staff were in the administrative group.

TABLE 6

DISTRIBUTION OF STAFF BY INSTITUTE POSITION

Institute Position		Responses f	%
Instructor		75	65.9
Junior Administration		29	26.8
Senior Instructor	9		
Section Head	13		
Department Head	7		
Administration		4	3.7
Total		108	100.0

4.2.2 Departmental Affiliation Within Institutes

Department affiliation of staff, shown in Table 7, indicates that engineering personnel were highly concentrated in the departments of Academic Studies - Math/Physics, Engineering Sciences - Chemistry/Drafting, Electrical and Electronics.

TABLE 7

DISTRIBUTION OF STAFF BY DEPARTMENTAL AFFILIATION WITHIN INSTITUTES

Institute Departments	Responses f	%
Academic Studies - Math/Physics	27	25.0
Auto/Diesel	1	0.9
Business Education	2	1.8
Construction - Structures	6	5.6
Engineering Sciences - Chemistry/ Drafting	27	25.0
Electrical	16	14.8
Electronics	17	15.8
Metals - Aeronautical/ Mechanical	6	5.6
Petroleum	1	0.9
Related Subjects	1	0.9
Administration	4	3.7
Total	108	100.0

4.2.3 Instructional Staff Ratings

Instructor rating, an index of the level of staff academic and professional preparation, is summarized in Table 8. Definitions for this study were such that all respondents were necessarily Instructor IV or Instructor V, indicating the possession of at least a four-year degree, or eligibility for professional registration.

Indeed, the stratified nature of this study group was apparent from Tod's data which indicated that on an institute-wide basis, only 20.9 per cent of the instructional group were classified as Instructor IV or Instructor V.

Although summarized in Table 8, data relating to educational preparation of staff are more explicitly stated in Article 4.3.2.

TABLE 8

DISTRIBUTION OF STAFF BY INSTRUCTOR RATING

Instructor Rating	Responses f	%
Instructor IV	65	60.2
Instructor V	39	36.1
Administration	4	3.7
Total	108	100.0

4.2.4 Extent of Institute Service

The extent of institute service of respondents is shown in Table 9. The age of N.A.I.T. limited possible employment at that institute to eight years; an exception was the N.A.I.T. staff member with 19 years of service, the first eleven of which were obtained at S.A.I.T.

Approximately one-half the respondents had four years or less service at the institutes, while approximately three-fourths exhibited service of six years or less. Rapid expansion of programs and staff requirements were perhaps most clearly

demonstrated by the observation that approximately one-third had been on institute staffs for three years or less.

The median value for the length of institute service was 4.6 years.

TABLE 9

DISTRIBUTION OF STAFF BY EXTENT OF INSTITUTE SERVICE

Years of Institute Service	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
1 or less	13	12.0	13	12.0
2	9	8.3	22	20.3
3	20	18.6	42	38.9
4	10	9.3	52	48.2
5	17	15.9	69	64.1
6	13	12.0	82	76.1
7	8	7.4	90	83.5
8	9	8.3	100	91.8
9	1	0.9	104	92.7
10	4	3.7	106	96.4
11	2	1.8	106	98.2
12	0	0.0	106	98.2
13	0	0.0	106	98.2
14	0	0.0	106	98.2
15	0	0.0	106	98.2
16	0	0.0	106	98.2
17	0	0.0	106	98.2
18	1	0.9	107	99.1
19	1	0.9	108	100.0
Total	108	100.0		

4.3 Professional Affiliation, Education, and Professional Experience

4.3.1 Professional Affiliation

The extent of staff participation in activities of the Association of Professional Engineers of Alberta is shown by data in Tables 10, 11, 12, 13 and 14.

The population definition was such that all respondents were at least eligible for Association membership, with Table 10 showing that 89 per cent of staff were currently members of A.P.E.A.

TABLE 10

DISTRIBUTION OF STAFF BY A.P.E.A. MEMBERSHIP STATUS

A.P.E.A. Membership Status	Responses f	%
Never a member	10	9.2
Formerly a member	2	1.8
Currently a member	96	89.0
Total	108	100.0

The methods of achieving A.P.E.A. membership eligibility are shown in Table 11, with 89 per cent of staff having achieved this status by means of university graduation and prescribed professional experience.

TABLE 11

DISTRIBUTION OF STAFF BY METHOD OF ACHIEVING A.P.E.A. MEMBERSHIP ELIGIBILITY

Method of Achieving A.P.E.A. Eligibility	Responses f	%
Examinations of A.P.E.A. or other professional Association	12	11.0
University Graduation plus Professional Experience	96	89.0
Total	108	100.0

Although A.P.E.A. membership was maintained by most of the eligible staff, Table 12 indicates that only 2.4 per cent of the respondents had performed service as an A.P.E.A. elected official, while Table 13 shows that voluntary committee membership had involved approximately one-fifth of the staff.

TABLE 12

DISTRIBUTION OF STAFF BY SERVICE AS AN A.P.E.A. ELECTED OFFICER (RESPONSES OF CURRENT OR FORMER MEMBERS)

Service as an Elected Officer	Responses f	%
Yes	2	2.4
No	96	97.6
Total	98	100.0

TABLE 13

DISTRIBUTION OF STAFF BY A.P.E.A. COMMITTEE MEMBERSHIP (RESPONSES OF CURRENT OR FORMER MEMBERS)

Committee Membership	Responses f	%
Yes	19	19.4
No	79	80.6
Total	98	100.0

Another index of staff involvement in A.P.E.A. activities is summarized in Table 14, which shows the perceived frequency of attendance at A.P.E.A. meetings. Over one-half the staff conceded that they attended seldom or never, with only 4.2 per cent viewing their attendance as regular.

TABLE 14

DISTRIBUTION OF STAFF BY PERCEIVED FREQUENCY OF ATTENDANCE AT A.P.E.A. MEETINGS (RESPONSES OF CURRENT MEMBERS)

Perceived Frequency of Attendance at A.P.E.A. Meetings	Responses f	%
Never	22	22.8
Seldom	33	34.5
Occasional	37	38.5
Regular	4	4.2
Total	96	100.0

Patterns of staff involvement in association activity were undoubtedly reflections of other perceptions summarized in Tables 15 and 16.

TABLE 15

DISTRIBUTION OF STAFF BY PERCEPTION OF A.P.E.A. MEMBERSHIP AS A CONDITION OF EMPLOYMENT

Is A.P.E.A. Membership Perceived as a Condition of Employment?	Responses f	%
Yes	11	10.2
No	97	89.8
Total	108	100.0

While few respondents perceived A.P.E.A. membership as a condition of employment (Table 15), over three-fourths conceded some desirability in the maintenance of membership (Table 16). Perceptions summarized in Table 16 show that over one-half the staff viewed maintained membership as highly desirable or desirable, with another one-fourth viewing such membership as of limited value.

TABLE 16

DISTRIBUTION OF STAFF BY PERCEPTION OF THE DESIRABILITY OF A.P.E.A. MEMBERSHIP

Perceived Desirability of A.P.E.A. Membership	Responses f	%
Of No Apparent Value	3	2.8
Of Questionable Value	15	13.9
Of Limited Value	26	24.0
Desirable	38	35.3
Highly Desirable	26	24.0
Total	108	100.0

The proportion of staff who perceived little or no value in A.P.E.A. membership (Table 16) corresponded approximately to those who have either never been A.P.E.A. members, or have relinquished their membership (Table 10).

The A.P.E.A. was the primary professional organization to which staff members belonged, although approximately one-fifth claimed membership in at least one more professional or semi-professional organization. Named among such associations were the Engineering Institute of Canada, The American Institute of Mechanical Engineers, The American Society of Civil Engineers, and The American Institute of Electrical Engineers.

Two institute organizations having professional and social facets are the Civil Service Association of Alberta (C.S.A.) and the Association of Technical Instructors of Alberta (A.T.I.A.). Although only 38 per cent of the respondents were members of the latter organization (Table 18), membership in the Civil Service Association of Alberta was claimed by 68.5 per cent of staff (Table 17).

TABLE 17

DISTRIBUTION OF STAFF BY MEMBERSHIP IN CIVIL SERVICE ASSOCIATION OF ALBERTA

Membership Status - Civil Service Association of Alberta	Responses f	%
A Member	73	68.5
Not A Member	35	31.5
Total	108	100.0

TABLE 18

DISTRIBUTION OF STAFF BY MEMBERSHIP IN ASSOCIATION OF TECHNICAL INSTRUCTORS OF ALBERTA

Membership Status - Association of Technical Instructors of Alberta	Responses f	%
A Member	41	38.0
Not A Member	67	62.0
Total	108	100.0

4.3.2 Education

Data pertaining to highest academic attainment of respondents, duration of study required to attain the highest level, and the geographic location of the training facility are summarized in Tables 19, 20, 21 and 22.

Table 19 shows that 89 per cent of the respondents achieved professional status by means of university graduation, substantiating results summarized in Table 11. Of the university graduates, approximately three-fourths possessed a four-year baccalaureate engineering degree (Bachelor of Science or Bachelor of Engineering), and another one-fourth had proceeded to the Master of Science (Engineering) or Master of Engineering degrees.

At the time of the study, only three of the university graduates had supplemented their undergraduate engineering degree with education in disciplines other than engineering; the degrees of Master of Business Administration, Master of Education and Bachelor of Education had each been achieved by one of the respondents.

TABLE 19

DISTRIBUTION OF STAFF BY HIGHEST ACADEMIC LEVEL ACHIEVED

Highest Academic Level Achieved		Responses f	%
P. Eng. Status by Examinations		12	11.0
Undergraduate Engineering Degree		69	64.1
Undergraduate Engineering Degree plus Graduate or Second Undergraduate Degree		27	24.9
B.Sc. and B.Ed.	1	0.9	
B.Sc. and M.Eng.	1	0.9	
B.Sc. and M.Sc.	23	21.3	
B.Sc. and M.Ed.	1	0.9	
B.Sc. and M.B.A.	1	0.9	
Total		108	100.0

Typically, university graduates possessing an undergraduate degree required four years of full-time, post-secondary study to attain this credential. Graduate degrees typically required an additional one or two years of study (Table 20).

Full-time post-secondary study summarized in Table 20 had a median value of 4.3 years.

TABLE 20

DISTRIBUTION OF STAFF BY NUMBER OF YEARS OF FULL-TIME POST-SECONDARY STUDY REQUIRED TO ACHIEVE HIGHEST ACADEMIC LEVEL (RESPONSES FOR UNIVERSITY GRADUATES)

Years of Full-Time Post-Secondary Required To Achieve Highest Academic Level	Responses f	%
4 years	61	63.5
5 years	15	15.6
6 years	18	18.9
7 years	2	2.0
Total	96	100.0

For respondents who achieved professional status by means of examinations of A.P.E.A. or other professional associations, required part-time study ranged from four to eight years (Table 21) with a median value of 5.8 years.

TABLE 21

DISTRIBUTION OF STAFF BY NUMBER OF YEARS OF PART-TIME STUDY REQUIRED TO ACHIEVE PROFESSIONAL STATUS (STAFF WHO ACHIEVED PROFESSIONAL STATUS BY ASSOCIATION EXAMINATIONS)

Years of Part-Time Study Required to Achieve Professional Status	Responses f	%
4 years	4	33.4
5 years	1	8.3
6 years	4	33.4
7 years	2	16.7
8 years	1	8.4
Total	12	100.0

The geographic location of the post-secondary institutions where staff obtained education cited in Table 19 are listed in Table 22. Approximately two-thirds of respondents obtained their post-secondary education entirely or primarily in Alberta, an additional

one-fifth were educated in Canadian provinces other than Alberta, and only one-seventh received such education outside Canada.

TABLE 22

DISTRIBUTION OF STAFF BY THE GEOGRAPHIC LOCATION OF THEIR POST-SECONDARY EDUCATION

Location of Post-Secondary Education	Responses f	%
All in Alberta	61	56.5
Largest part in Alberta	9	8.3
All in Canadian Province other than Alberta	15	13.9
Largest Part in Canadian Province other than Alberta	8	7.4
Largest Part in U.S.A.	7	6.5
Largest Part in British Isles	7	6.5
Other	1	0.9
Total	108	100.0

Data in Table 22 shows that all staff responded to the question pertaining to the location of their post-secondary education. It was likely, however, that the twelve staff who achieved professional status by means of self-study had no formal post-secondary education; their responses apparently reflected the geographic location of the association responsible for coordinating their self-study.

Engineering disciplines represented by respondents are shown in Table 23. For staff who possessed educational credentials above the baccalaurate in engineering, analysis was on the basis that fields of activity of staff with graduate degrees, and for staff possessing education in disciplines other than the field of their undergraduate engineering degree, the discipline represented by their undergraduate engineering degree is shown.

TABLE 23

DISTRIBUTION OF STAFF BY ENGINEERING DISCIPLINES

Engineering Discipline	P. Eng. Status by Examinations	Undergraduate Engineering Degree	Graduate Engineering Degree	Responses f	%
Aeronautical	1	2	1	4	3.7
Chemical/ Petroleum	0	9	2	11	10.2
Civil	3	20	14	37	34.3
Electrical	4	30	2	36	33.3
Mechanical	4	11	4	19	17.6
Metallurgical	0	0	1	1	0.9
Total	12	72	24	108	100.0

Practically all (99.1 per cent) staff perceived their educational preparation to be at least adequate for their employment requirements (Table 24).

TABLE 24

DISTRIBUTION OF STAFF BY PERCEIVED ADEQUACY OF EDUCATION PREPARATION

Perceived Adequacy of Educational Preparation For Employment Requirements	Responses f	%
Inadequate	1	0.9
Adequate	102	94.5
Excessive	5	4.6
Total	108	100.0

Despite such perceptions reported in Table 24, approximately one-third of the staff were engaged in formal upgrading programs (Table 25).

TABLE 25

DISTRIBUTION OF STAFF BY ENROLLMENT IN FORMAL UPGRADING

Enrolled in Formal Upgrading Program	Responses f	%
Yes	35	32.5
No	73	67.5
Total	108	100.0

Formal upgrading programs in which staff were enrolled are summarized in Table 26 ; slightly more than one-half of those involved in formal upgrading were engaged in graduate engineering study, with the remainder enrolled in upgrading to education or arts degrees.

TABLE 26

DISTRIBUTION OF STAFF BY FORMAL UPGRADING PROGRAM

Formal Upgrading Program	Responses f	%
B.A.	1	2.9
B.Ed.	9	25.6
Graduate Diploma in Education	1	2.9
M.Ed.	7	20.0
M.Eng.	8	22.7
M.Sc. (Eng.)	6	17.2
Ed.D.	1	2.9
Ph.D. (Civil Engineering)	2	5.8
Total	35	100.0

Educational leave, available to staff to assist in their professional development, had been requested by one-fifth of the respondents (Table 27), the majority of whom had been granted such leave. That is, of those who had applied for educational leave, 82 per cent had received it.

TABLE 27

DISTRIBUTION OF STAFF BY EDUCATIONAL LEAVE EXPERIENCE

Educational Leave Experience	Responses f	%
Applied For:		
Yes	22	20.5
No	86	79.5
Total	108	100.0
If Applied For, Was Leave Granted:		
Yes	18	82.0
No	4	18.0
Total	22	100.0

The purposes of educational leave are shown in Table 28. Approximately 60 per cent of the educational leaves were for study in engineering disciplines, with the remainder directed to undergraduate and graduate study in education.

TABLE 28

DISTRIBUTION OF STAFF BY PURPOSE OF EDUCATIONAL LEAVE

Program for Which Educational Leave Granted	Responses f	%
B.Ed.	2	11.1
M.Ed.	4	22.2
M.Eng.	5	27.8
M.Sc. (Eng.)	6	33.3
Ed.D.	1	5.6
Total	18	100.0

Only 13.8 per cent of respondents possessed a Teaching Certificate, most of which had been obtained in Alberta. The majority of staff (86.2 per cent) had never held an Alberta Teaching Certificate, according to responses summarized in Table 29.

TABLE 29

DISTRIBUTION OF STAFF BY POSSESSION OF AN ALBERTA TEACHING CERTIFICATE

Status With Regard to Possession of an Alberta Teaching Certificate	Responses f	%
Never held an Alberta Teaching Certificate	93	86.2
First Teaching Certificate in Alberta	10	9.2
First Teaching Certificate in another Province	4	3.7
First Teaching Certificate in another Country	1	0.9
Total	108	100.0

4.3.3 Professional Experience

Types of professional experience of interest in this study were:

(a) professional engineering experience obtained prior to joining the institutes,

(b) professional engineering experience obtained during the summer vacation period or the academic year while on institute staff, and

(c) teaching experience possessed prior to joining the institutes.

Miscellaneous aspects of professional experience and maintained industrial contact were also investigated, and are reported.

4.3.3 a. Extent of Professional Engineering Experience Prior to Becoming Institute Staff

The extent of professional engineering experience possessed by staff prior to their becoming institute employees is summarized in Tables 30 and 31. Professional experience was defined as experience obtained in the interval from attainment of Professional Engineer (P.Eng.) status or eligibility, and commencement of institute employment. For staff who achieved Professional Engineer status by means of Association examinations,

the period considered was from the time of conferral of professional status, to their employment as a member of institute staff. For university graduates, the interval reported was from the time of achieving eligibility for professional status to the time they joined the institutes.

Refined definitions of professional experience for university graduates was thought necessary because many such staff did not register with a professional association when they became eligible, since such registration was often not a condition of their employment. Consequently, many respondents who became eligible for professional registration two years after their graduation did not register with a professional association, even though practicing professionally in the interim. In such cases, the date of formal association registration could not reasonably be considered the time at which professional activity began.

Professional engineering activity prior to institute employment is categorized in Table 30, and shown in more quantitative detail in Table 31.

Categories of experience reported in Table 30 reflect that staff either:

(a) were not eligible for association membership until after they had become institute staff members, in which case they were viewed as possessing negative professional experience, or

(b) became eligible for association memberships in the same calendar year in which they became institute staff, exhibiting zero professional experience, or

(c) were registered or were eligible for registration prior to becoming institute employees, and thus exhibited positive professional experience.

On the basis of the defined experience categories, data in Table 30 show that one-fifth of the respondents were ineligible for association registration when they became institute employees; another one-eighth became eligible for such membership the same year in which they joined the institutes. Two-thirds of the respondents possessed sufficient professional experience that they were registered with the association, or were eligible for membership, when they became institute employees.

TABLE 30

DISTRIBUTION OF STAFF BY ENGINEERING EXPERIENCE POSSESSED PRIOR TO INSTITUTE EMPLOYMENT

Category of Engineering Experience	Responses f	%
Negative	23	21.3
Zero	14	13.0
Positive	71	65.7
Total	108	100.0

The distribution of professional engineering experience prior to institute employment is shown in Table 31. Consistency in the definition of professional experience was maintained in presentation of data in Tables 30 and 31. That is, staff ineligible for professional registration, and those who became eligible the same year they joined the institutes, are recorded in Table 31 as possessing zero years of professional experience.

TABLE 31

DISTRIBUTION OF STAFF BY THE NUMBER OF YEARS OF PROFESSIONAL ENGINEERING EXPERIENCE POSSESSED PRIOR TO INSTITUTE EMPLOYMENT

Years of Prior Professional Engineering Experience	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
0	37	34.3	37	37.3
1	11	10.7	48	45.0
2	5	4.6	53	49.6
3	5	4.6	58	54.2
4	9	8.3	67	62.5
5	10	9.2	77	71.7
6	2	1.8	79	73.5
7	4	3.7	83	77.2
8	3	2.8	86	80.2
9	5	4.6	91	84.6
10	2	1.8	93	86.4
11	1	0.9	94	87.3
12	0	0.0	94	87.3
13	4	3.7	98	91.0
14	2	1.8	100	92.8
15	2	1.8	102	94.6
16	0	0.0	102	94.6
17	1	0.0	103	95.5
18	1	0.9	104	96.4
19	0	0.0	104	96.4
20	0	0.0	104	96.4
21	1	0.9	105	97.3
28	1	0.9	106	98.2
31	1	0.9	107	99.1
32	0	0.0	107	99.1
33	1	0.9	108	100.0
Total	108	100.0		

The extent of professional engineering experience is seen to range up to 36 years, with a median of 2.7 years. One-half the staff possessed two years or less professional engineering experience prior to becoming an institute employee; similarly, three-fourths possessed six years or less prior professional engineering experience

Although the extent of professional experience is an index of staff development, a system of the Canadian Council of Professional Engineers (C.C.P.E.) is perhaps a more rational basis for assessing the level of staff accomplishment. This system (Appendix C) incorporates factors such as a description of typical duties, supervision received and leadership authority exercised in the attempt to categorize engineers into professional levels. While almost directly reflecting the duration of experience obtained during a professional career, the system also reflects consideration of exceptionally rapid or slow professional development. The seven defined professional levels form a comparative basis for the description of professional quality of individuals or staff groups.

Table 32 summarizes perceived levels of professional development which staff viewed as descriptive of their status when they joined the institutes. Using the C.C.P.E. criterion that level C defines the "fully-qualified professional engineer", data reported in Table 32 show that fewer than one-half of the respondents so classified themselves.

TABLE 32

DISTRIBUTION OF STAFF BY PERCEIVED C.C.P.E. LEVEL UPON BECOMING INSTITUTE EMPLOYEE

Perceived C.C.P.E. Level		Responses f		%
Negative Experience		23		21.3
Zero Experience		14		13.0
Positive Experience		71		65.7
Level B	22		20.4	
Level C	27		25.0	
Level D	10		9.2	
Level E	5		4.6	
Level F	7		6.5	
Total		108		100.0

4.3.3 b. Engineering Disciplines from which Staff Recruited

The engineering disciplines from which staff were recruited for institute employment are shown in Table 33.

Data in Table 33 show that almost two-thirds of the staff were recruited from the disciplines of civil and electrical engineering, while another one-sixth were employed in mechanical engineering activity when they joined the institutes.

TABLE 33

DISTRIBUTION OF STAFF BY THE ENGINEERING DISCIPLINE IN WHICH THEY WERE ENGAGED WHEN RECRUITED

Engineering Discipline	Responses f	%
Aeronautical	6	5.6
Chemical/Petroleum	10	9.2
Civil	32	29.7
Electrical	36	33.4
Mechanical	19	17.6
Metallurgical	1	0.9
Other		
Industrial	1	0.9
Land Surveying	1	0.9
Computers	2	1.8
Total	108	100.0

Clarification of responses reported in Table 33 is perhaps warranted, to prevent misinterpretation. The question on which the responses are based asked (question C.3.1): "In what field of engineering did you obtain most of your professional experience, prior to coming to the institute?" Implied in the question was a looser definition of "professional engineering" than has been necessary for analysis in Article 4.3.3 a; that is, the field of engineering activity was the object of enquiry, rather than any attempt to ascertain the level of professional performance in that field.

The type of engineering activity (Tables 34 and 35) within the disciplines stated in Table 33 further describes the engineering activity in which staff had been engaged before recruitment to the institutes.

Tables 34 incorporates data which differentiate governmental activities from those in the private sector. Approximately 33 per cent of the respondents described their professional engineering activities prior to becoming institute employees as essentially in the

governmental section; those with governmental background were equally divided between federal and provincial agencies.

TABLE 34

DISTRIBUTION OF STAFF BY SECTOR OF PROFESSIONAL ENGINEERING ACTIVITY PRIOR TO INSTITUTE EMPLOYMENT (GOVERNMENTAL-PRIVATE)

Type of Professional Engineering Activity Prior to Institute Employment		Responses f	%
Governmental		33	30.5
Federal	14		
Provincial	14		
Civic	2		
Other	3		
Private		71	66.0
No Response		4	3.5
Total		108	100.0

More detailed classification of the types of prior professional activity is shown by responses summarized in Table 35. Types of engineering activity listed are broad and not mutually exclusive;

all engineering disciplines include the activities listed. Although respondents were asked to indicate only one response to describe their primary engineering activity (Question C.3.4), many respondents listed several activities. In such cases, the responses were treated as ranked data and the primary activity is reported in Table 35.

TABLE 35

DISTRIBUTION OF STAFF BY TYPE OF PROFESSIONAL ACTIVITY PRIOR TO INSTITUTE EMPLOYMENT (GOVERNMENTAL AND PRIVATE SECTORS)

Employment Sector	Type of Professional Activity						
	Design	Contracting/ Construction	Inspection	Materials Control	Consulting	Other	Total
Governmental							
Federal	5	1	2	3	0	3	14
Provincial	4	5	2	1	0	2	14
Civic	1	0	0	0	0	1	2
Other	3	0	0	0	0	0	3
Private	36	12	1	3	9	10	71
No Response	-	-	-	-	-	-	4
Total Responses	49	18	5	7	9	16	108

Other activities reported by staff from the federal governmental sector include military officer, research and maintenance. In the provincial government group, one other response was obtained for each of maintenance and specification writing, whereas the other civic government response involved teaching.

Responses for those from the private sector were more diverse, with other activities reported as management, exploration, petroleum production, research, sales, geophysics, maintenance, and chemical processing.

4.3.3 c. Geographic Location of Experience Prior to Institute Employment

The majority of staff had engineering experience prior to institute employment entirely or primarily in Alberta, according to information summarized in Table 36. Only one-fifth had practiced in Canadian provinces other than Alberta, and only one-tenth outside Canada.

TABLE 36

DISTRIBUTION OF STAFF BY GEOGRAPHIC LOCATION OF ENGINEERING EXPERIENCE PRIOR TO INSTITUTE EMPLOYMENT

Geographic Location of Experience		Responses f		%
All in Alberta		35		32.4
Largest Part in Alberta		36		33.4
All in Canadian Province other than Alberta		23		21.3
Largest Part in U.S.A.		4		3.7
Largest Part Elsewhere		10		9.2
Ceylon	1		0.9	
Hungary	1		0.9	
Ireland	1		0.9	
U.K.	5		4.7	
South Africa	1		0.9	
West Germany	1		0.9	
Total		108		100.0

4.3.3 d. Professional Engineering Experience Obtained While on Institute Staff

Of importance equal to professional experience prior to institute employment is the extent of professional involvement while on institute staff. Such contact can be obtained during the academic year or in the two-month summer vacation period. With the proviso that staff do not neglect their primary institute responsibilities, these professional contacts are strongly encouraged by the administration within the institutes.

Staff involvement in professional engineering activities during the summer is shown in Table 37. The table provides information that relates the number of summers employed in a professional capacity to the number of summers on staff, presumably available for employment. There was no attempt to ascertain the level of reported activity, nor to reflect involvement for less than the entire two-month summer vacation period.

TABLE 37

DISTRIBUTION OF STAFF BY THE EXTENT OF PROFESSIONAL ENGINEERING ACTIVITY DURING SUMMER VACATION PERIODS

Number of Summers on Staff	Number of Summers Involved in Professional Activities								
	0	1	2	3	4	5	6	7	Total
1	12	1	-	-	-	-	-	-	13
2	6	3	-	-	-	-	-	-	9
3	15	1	4	-	-	-	-	-	20
4	6	1	2	-	1	-	-	-	10
5	13	1	1	1	-	-	-	-	17
6	8	-	2	1	-	1	-	-	12
7	2	1	1	2	1	-	-	1	8
8	5	2	-	-	1	-	-	-	8
9	1	-	-	-	-	-	-	-	1
10	3	-	1	-	-	-	-	-	4
11	2	-	-	-	-	-	-	-	2
Total	73	11	11	4	3	1	0	1	104

Administrative staff were excluded from the summary, since the conditions of their employment generally prevent involvement in extra professional activities during the vacation period.

Staff involvement in summer professional activity was found to range from zero for 73 staff members to seven for the individual who was professionally employed each of the seven vacation periods during which he was on institute staff.

The extent of professional engineering activity during the academic year was assessed by staff estimating the number of hours per week of professional activities they spent in excess of that required for the performance of their institute duties. Responses of the administrative group were included in data summarized in Table 38, since their conditions of employment do not prevent their involvement in such activities.

Most of the staff (78.7 per cent) maintained no professional involvement during the academic year, while another 10 per cent estimated their activity as 1 to 2 hours per week. Only 11 per cent of the respondents devoted more than 2 hours per week, and 4.8 per cent devoted more than 8 hours per week to extra institute professional engineering endeavor.

TABLE 38

DISTRIBUTION OF STAFF BY THE EXTENT OF PROFESSIONAL ENGINEERING ACTIVITY DURING THE ACADEMIC YEAR (EXCLUSIVE OF INSTITUTE DUTIES)

Extra-Institute Professional Engineering Activity	Responses f	%
0	85	78.7
1-2	11	10.2
3-4	7	6.5
5-6	0	0.0
7-8	0	0.0
9-10	3	2.8
11-12	1	0.9
13-14	0	0.0
15-16	0	0.0
17-18	1	0.9
Total	108	100.0

4.3.3 e. Teaching Experience Prior to Institute Employment

Of the 37 per cent of the staff who indicated that they possessed teaching experience prior to institute employment (Table 39), Table 40 shows the diversity of such experience.

TABLE 39

DISTRIBUTION OF STAFF BY POSSESSION OF TEACHING EXPERIENCE PRIOR TO INSTITUTE EMPLOYMENT

Was Teaching Experience Possessed Prior to Institute Employment?	Responses	
	f	%
Yes	40	37.0
No	68	63.0
Total	108	100.0

No attempt was made in the questionnaire to qualify nor define the term teaching experience. Broad interpretation resulted, with 11 respondents (10.2 per cent of all staff) reporting that they had teaching experience at the primary/secondary school levels. Only six respondents or 15 per cent of those indicating teaching experience, reported that their experience was in some type of technical institute (Table 40). Fifteen of the respondents reporting teaching experience prior to institute employment obtained such background

while sessional instructors during post-graduate study (Table 40).

TABLE 40

DISTRIBUTION OF STAFF BY THE TYPES OF POSSESSED TEACHING EXPERIENCE PRIOR TO INSTITUTE EMPLOYMENT

Type of Prior Teaching Experience	Responses f	%
Military	5	12.5
Junior High School	1	2.5
High School	9	22.5
Normal School	1	2.5
Technical Institute	6	15.0
University		
(a) Sessional Instructor while Graduate Students	15	37.5
(b) Other	3	7.5
Total	40	100.0

4.3.3 f. Miscellaneous Aspects of Professional Experience and Industrial Contact

Responses summarized in Table 41 show that 92 per cent of the staff viewed their industrial-professional experience prior to institute employment as at least adequate for the performance of their institute duties. Only 7 per cent perceived their experience to be inadequate, while 13 per cent assessed their experience as excessive for their institute roles.

TABLE 41

DISTRIBUTION OF STAFF BY PERCEIVED ADEQUACY OF PROFESSIONAL EXPERIENCE FOR INSTITUTE DUTIES

Perceived Adequacy of Professional Experience Prior to Institute Employment	Responses f	%
Inadequate	8	7.4
Adequate	86	79.6
Excessive	14	13.0
Total	108	100.0

Other perceptions and responses pertaining to adequacy of staff preparation and the use of industrial leave as a mechanism for upgrading are shown in Tables 42 and 43. Industrial leave is an opportunity for staff to re-enter industry, while retaining a position at the institutes to which to return.

Two-thirds of staff perceived industrial leave as more valuable than educational leave, for purposes of staff development.

TABLE 42

DISTRIBUTION OF STAFF BY PERCEPTION OF RELATIVE VALUE OF INDUSTRIAL LEAVE AND EDUCATIONAL LEAVE

Do you Perceive Industrial Leave To Be of Greater Value than Educational Leave?	Responses f	%
Yes	69	63.9
No	20	18.5
Of equal value	19	17.6
Total	108	100.0

Despite perceptions reported in Table 42, however, few staff have pursued the possibility of obtaining industrial leave from the institutes. Thus, while two-thirds of the staff viewed industrial leave as preferable to educational leave as a vehicle for staff development, only four respondents had applied for industrial leave (Table 43).

TABLE 43

DISTRIBUTION OF STAFF BY DEMONSTRATED INTEREST IN OBTAINING INDUSTRIAL LEAVE

Have you Applied for Industrial Leave from the Institute?	Responses f	%
Yes	4	3.7
No	104	96.3
Total	108	100.0

The disposition of applications for industrial leave is perhaps an index of administrative attitudes within the institutes. It appears that the administrative group are inclined to support such a mechanism of staff development, since all four applicants were granted the leave for which they applied.

4.4 Conditions of Employment

Primary aspects of employment conditions, work load and income, are reported in Articles 4.4.1 and 4.4.2.

4.4.1 Work Load

Work load data were obtained for both (a) assigned work loads, and (b) estimated weekly work loads required to perform institute duties. Reported data were estimated average loads, since both assigned and total work loads varied considerably throughout the academic year.

The validity of the reported load data must be considered in view of the self reporting format used, and the self perceptions involved

in reporting staff loads. Even assigned work load values might show distortion because of such a format; estimated total work loads could be expected to be even more so affected.

4.4.1 a. Assigned Work Loads

Assigned work loads were obtained for all staff except the administrative group. Assigned work load data for the entire instructional group, including Instructors, Senior Instructors, Section Heads and Department Heads, are summarized in Table 44.

Almost one-half the respondents reported assigned work loads of 17 hours or less per week, and almost three-fourths of staff less than 20 hours per week. The median value for assigned work load was 17.8 hours per week.

TABLE 44

DISTRIBUTION OF STAFF BY ASSIGNED WORK LOAD
(ENTIRE INSTRUCTIONAL GROUP)

Assigned Work Load Hours Per Week	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
0-1	0	0.0	0	0.0
2-3	2	1.9	2	1.9
4-5	3	2.9	5	4.8
6-7	3	2.9	8	7.7
8-9	1	1.0	9	8.7
10-11	7	6.7	16	15.4
12-13	10	9.6	26	25.0
14-15	10	9.6	36	34.6
16-17	12	11.5	48	46.1
18-19	26	25.0	74	71.1
20-21	23	22.1	97	93.2
22-23	6	5.8	103	99.9
24-25	1	1.0	104	100.0
Total	104	100.0		

Analysis of responses on the basis of organizational rank resulted in data reported in Tables 45 and 46.

Assigned work loads of line instructors were reported as ranging from 12 to 25 hours per week (Table 45). Almost two-thirds reported

loads less than 20 hours per week, with a median load of 18.8 hours per week.

TABLE 45

DISTRIBUTION OF STAFF BY ASSIGNED WORK LOADS (LINE INSTRUCTORS)

Assigned Work Load, Hours Per Week	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
12-13	4	5.3	4	5.3
14-15	6	8.0	10	13.3
16-17	11	14.6	21	27.9
18-19	25	33.3	46	61.2
20-21	23	30.8	69	92.0
22-23	5	6.7	74	98.7
24-25	1	1.3	75	100.0
Total	75	100.0		

Assigned work loads for the junior-administrative ranks of Senior Instructor, Section Heads and Department Heads were reported to be lower than for the line instructors. Table 46

shows assigned workloads for these junior administrative ranks, ranging from 2 to 23 hours per week. The median value of data in Table 46 was 11.1 hours per week, with three-fourths of the respondents reporting loads of 13 hours per week or less.

TABLE 46

DISTRIBUTION OF STAFF BY ASSIGNED WORK LOADS, (SENIOR INSTRUCTORS, SECTION HEADS AND DEPARTMENT HEADS)

Assigned Work Load, Hours Per Week	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
2-3	2	6.8	2	6.8
4-5	3	10.4	5	17.2
6-7	3	10.4	8	27.6
8-9	1	3.4	9	31.0
10-11	7	24.2	16	55.2
12-13	6	20.8	22	76.0
14-15	4	13.8	26	89.8
16-17	1	3.4	27	93.2
18-19	1	3.4	28	96.6
20-21	0	0.0	28	96.9
22-23	1	3.4	29	100.0
Total	29	100.0		

Comparison of data reported in Tables 44, 45 and 46 to norms of assigned load is not meaningful. Defined loads are variable, to reflect program diversity within the institutes, and have been modified during the development of the institutes.

On the basis of precedent, load norms defined in current manuals for institute instructional staff can be broadly stated as:

- up to 20 hours per week for instructors in a predominantly lecture situation, with levels up to 25 hours per week in a laboratory or shop situation,

- up to 16 hours per week for Senior Instructors and Section Heads in a predominantly lecture situation,

- a maintained instructional load for Department Heads. The primary intent is that Department Heads shall instruct, with no attempt to quantify the defined load levels.

4.4.1 b. Estimated Total Work Loads

In order to discharge the assigned work loads described in Article 4.4.1 a, staff reported the information summarized in Table 47 pertaining

to estimated total weekly work loads. As for assigned work loads, analysis on the basis of rank appeared warranted. Data for assigned work load (Article 4.4.1 a) were reported only for staff up to the level of Department Head, since only they had explicitly assigned work loads. Total estimated work loads, reported by all 108 staff, are shown in Table 47, resulting in a median value of 42.1 hours per week.

TABLE 47

DISTRIBUTION OF STAFF BY ESTIMATED TOTAL WORK LOAD (ENTIRE GROUP)

Estimated Total Work Load, Hours Per Week	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
30-34	9	8.3	9	8.3
35-39	21	19.5	30	27.8
40-44	46	42.6	76	70.4
45-49	19	17.6	95	88.0
50-54	6	5.6	101	93.6
55-59	2	1.8	103	95.4
60-64	4	3.7	107	99.1
65-69	1	0.9	108	100.0
Total	108	100.0		

Table 48 summarizes total work load data reported by the line instructors. Approximately one-third of staff estimated their total loads to be less than 40 hours per week, and three-fourths reported total loads of less than 45 hours per week. The median total work load was 41.6 hours per week.

TABLE 48

DISTRIBUTION OF STAFF BY ESTIMATED TOTAL WORK LOAD - LINE INSTRUCTORS

Estimated Total Work Loads, Hours Per Week	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
30-34	7	9.4	7	9.4
35-39	17	22.7	24	32.1
40-44	32	42.6	56	74.7
45-49	10	13.3	66	88.0
50-54	3	4.0	69	92.0
55-59	2	2.7	71	94.7
60-64	3	4.0	74	98.7
65-69	1	1.3	75	100.0
Total	75	100.0		

Data for staff above the rank of line instructor are shown in Table 49. Approximately three-fifths of this group reported weekly loads of less than 45 hours, with a median score for the group of 43.2 hours per week.

TABLE 49

DISTRIBUTION OF STAFF BY ESTIMATED TOTAL WORK LOAD (STAFF ABOVE LINE INSTRUCTOR RANK)

Estimated Total Work Load, Hours Per Week	Responses		Cumulative Responses	
	f	%	f	%
30-34	2	6.1	2	6.1
35-39	4	12.2	6	18.3
40-44	14	42.3	20	60.6
45-49	9	27.3	29	87.9
50-54	3	9.1	32	97.0
55-59	0	0.0	32	97.0
60-64	1	3.0	33	100.0
65-69	0	0.0	33	100.0
Total	33	100.0		

4.4.1 c. Summary - Assigned and Total Work Load

Median values of assigned and total work loads (Articles 4.4.1 a and 4.4.1 b) are summarized in Table 50, and shown graphically in Figures 1 and 2.

TABLE 50

SUMMARIZED WORK LOAD - ASSIGNED AND TOTAL LOAD

Load - Group	Load-Hours n	Per Week Median
Assigned Work Load		
a) Entire Instructional Group	104	17.8
b) Line Instructors	75	18.8
c) Senior Instructors, Section Heads, Department Heads	29	11.1
Total Work Loads		
a) Entire Group	108	42.1
b) Line Instructors	75	41.6
c) Staff Above Rank of Line Instructor	33	43.2

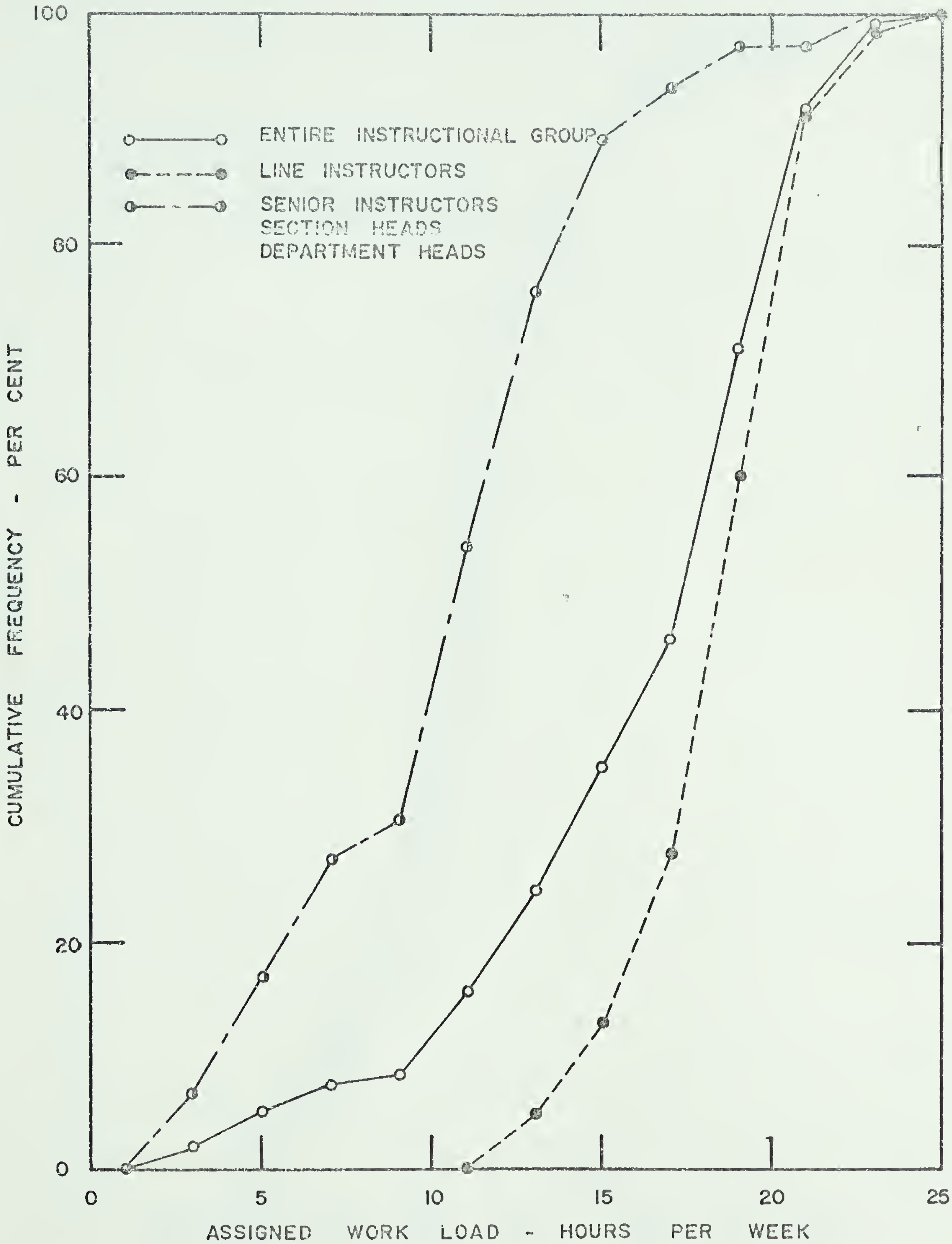


FIGURE I.

DISTRIBUTION OF STAFF BY ASSIGNED WORK LOAD

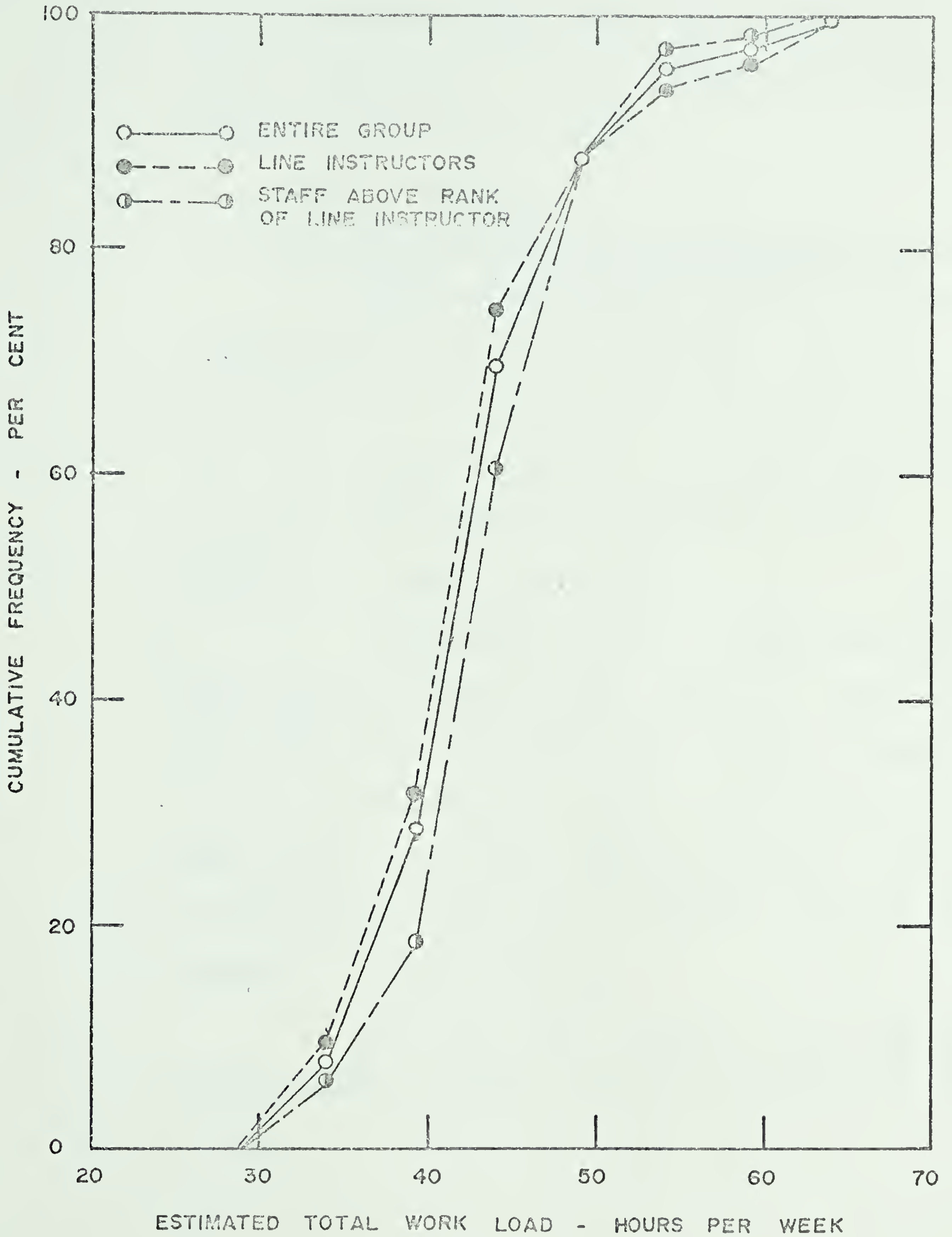


FIGURE 2

DISTRIBUTION OF STAFF BY ESTIMATED TOTAL WORK LOAD

4.4.2 Income

Income data are reported in Articles 4.4.2 a and 4.4.2 b, with analysis of rank by staff, and source of income.

4.4.2 a. Income From Normal Institute Activities

Perhaps of primary interest in this portion of the study was the income component obtained from normal institute activities, that is, those duties specified in the role definition for staff and performed essentially in the defined governmental work week.

Income data for all respondents are summarized in Table 51, and indicate a range from less than $8,000 to more than $15,000 per year, for the performance of normal institute duties. Approximately one-half reported salaries in excess of $11,000 per year, and one-third, salaries in excess of $12,000 per year.

The four staff members of the administrative group reported salaries in excess of $15,000 per year, as did one Department Head.

The entire staff group reported salaries for normal institute duties with a median of $11,200 per year.

TABLE 51

DISTRIBUTION OF STAFF BY INCOME FROM NORMAL INSTITUTE ACTIVITIES (ENTIRE GROUP)

Income-Dollars Per Year	Responses f	%	Cumulative Responses f	%
7000-7999	1	0.9	1	0.9
8000-8999	4	3.7	5	4.6
9000-9999	19	17.6	24	22.2
10000-10999	26	24.1	50	46.3
11000-11999	26	24.1	76	70.4
12000-12999	13	12.1	89	82.5
13000-13999	9	8.3	98	90.8
14000-15000	5	4.6	103	95.4
Over 15000	5	4.6	108	100.0
Total	108	100.0		

Salary data, with differentiation on the basis of rank, are shown in Tables 52 and 53.

Reported salaries for the line instructional group (Table 52) ranged from less than \$8000 per year to \$13,000 per year, with a median salary of \$10,520 per year, and one-third with a salary in excess of \$11,000 per year.

TABLE 52

DISTRIBUTION OF STAFF BY INCOME FROM NORMAL INSTITUTE ACTIVITIES (LINE INSTRUCTORS)

Income-Dollars Per Year	Responses f	%	Cumulative Responses f	%
7000-7999	1	1.3	1	1.3
8000-8999	4	5.2	5	6.5
9000-9999	19	25.4	24	31.9
10000-10999	26	34.7	50	66.6
11000-11999	19	25.4	69	92.0
12000-12999	6	8.0	75	100.0
Total	75	100.0		

Table 53 summarizes salary data for the staff group above the rank of line instructor, but excluding the four administrators. One-fifth of the junior administrative Senior Instructor - Section Head - Department Head group received salaries in excess of $14,000 per year. The junior administrative Senior Instructor - Section Head - Department Head group had a median salary of $13,050 per year.

TABLE 53

DISTRIBUTION OF STAFF BY INCOME
FROM NORMAL INSTITUTE ACTIVITIES
(SENIOR INSTRUCTORS, SECTION HEADS AND DEPARTMENT HEADS)

Income-Dollars Per Year	Responses f	Responses %	Cumulative Responses f	Cumulative Responses %
11000-11999	7	24.1	7	24.1
12000-12999	7	24.1	14	48.2
13000-13999	9	31.2	23	79.4
14000-14999	5	17.2	28	96.6
Over 15000	1	3.4	29	100.0
Total	29	100.0		

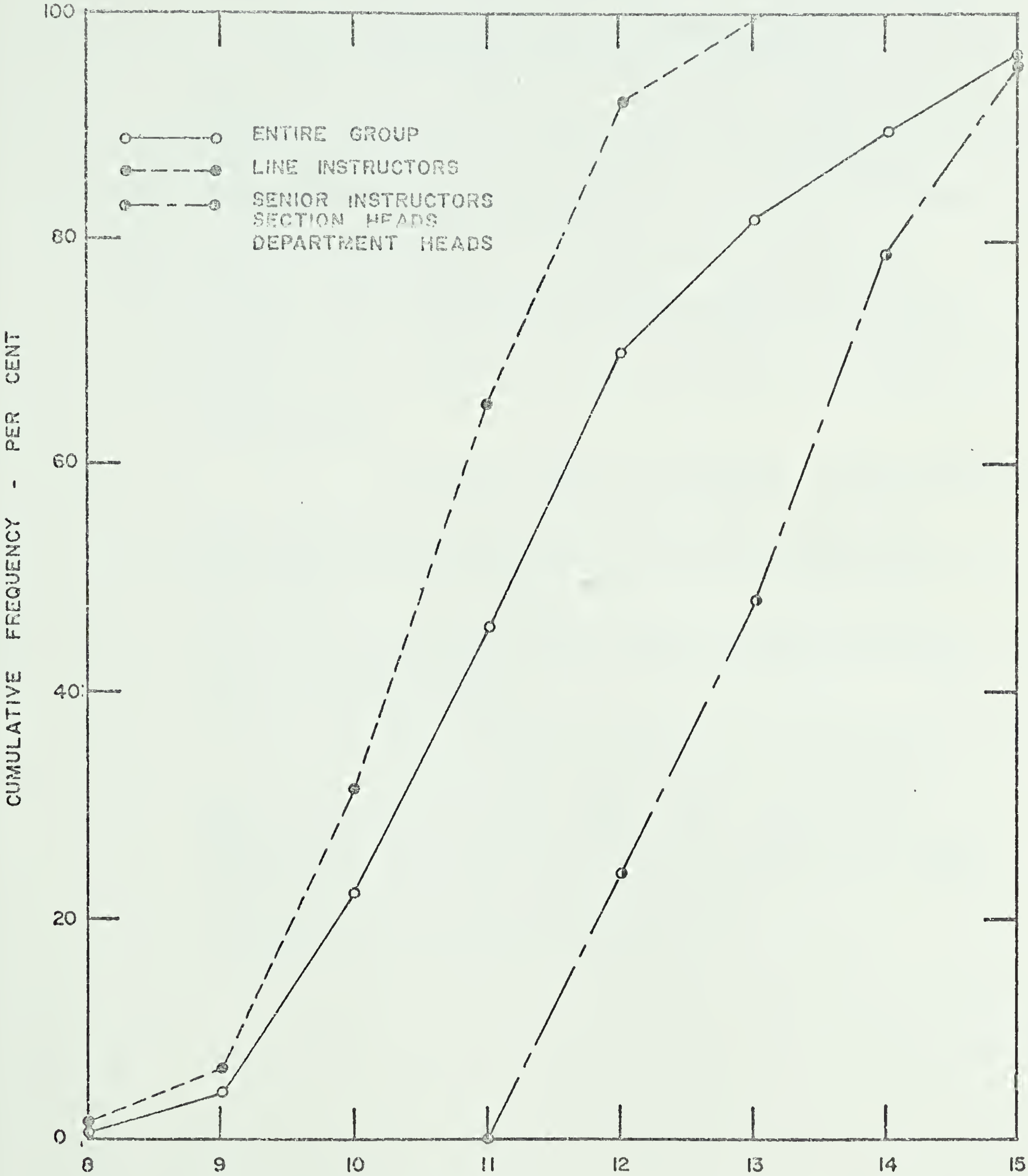
The salaries of the four administrators were all in excess of $15,000 per year, but more precise data for this group were not obtained.

Summarized salary data for normal Institute duties are shown in Table 54 and Figure 3.

TABLE 54

SUMMARIZED SALARIES FROM NORMAL INSTITUTE ACTIVITIES

Group	Salaries-Dollars Per Year n	Median
A) Entire Group	108	11,200
B) Line Instructors	75	10,520
C) Senior Instructors, Section Heads, Department Heads	29	13,050



INCOME FROM NORMAL INSTITUTE ACTIVITIES
THOUSANDS OF DOLLARS

FIGURE 3.

DISTRIBUTION OF STAFF BY INCOME FROM NORMAL INSTITUTE ACTIVITIES

4.4.2 b. Income From Other Professional Duties

Although income from normal institute activities was viewed as the income component of primary interest in this study, the extent of extra income from other professional activities was also reported. In addition to more precisely describing staff income, such data also reflect the extent of extra-institute professional involvement.

A common type of reported extra activity was that associated with Continuing Education offerings of the institutes. For instructing in evening programs, and short courses there is extra compensation.

Data reported in Table 55 indicate that 37.9 per cent of staff were involved in Continuing Education activities during the year in which this study was performed.

TABLE 55

DISTRIBUTION OF STAFF BY INVOLVEMENT IN CONTINUING EDUCATION ACTIVITIES

Were You Involved In Instructing Continuing Education Activities Of the Institute at any Time During This Year?	Responses f	%
Yes	41	37.9
No	67	62.1
Total	108	100.0

The distribution of reported income from instruction in Continuing Education activities is shown in Table 56. Twenty-four per cent of staff with such income reported income of less than \$500, 56 per cent reported \$500 to \$999 and 20 per cent more than \$1000.

TABLE 56

DISTRIBUTION OF STAFF BY INCOME FROM CONTINUING EDUCATION INSTRUCTION

Income-Dollars Per Year	Responses f	%
No Income	67	62.1
Under 500	10	9.2
500 - 999	23	21.3
1000 - 1499	7	6.5
Over 1500	1	0.9
Total	108	100.0

As reported previously (Article 4.3.3 d), there was some professional activity during the academic year, other than normal institute duties and Continuing Education instruction. As indices of the extent of extra professional involvement, the 78.7 per cent of staff who reported no other professional involvement (Table 38) corresponded approximately to data in Table 57 which show that 71.3 per cent reported no income from other professional duties.

TABLE 57

DISTRIBUTION OF STAFF BY INCOME FROM OTHER PROFESSIONAL ACTIVITIES

Income-Dollars Per Year	Responses f	%
No Income	77	71.3
Under 500	13	12.0
500 - 999	6	5.6
1000 - 1499	6	5.6
1500 - 1999	4	3.7
Over 2000	2	1.8
Total	108	100.0

4.5 Miscellaneous Perceptions and Ambitions

4.5.1 Perceived Satisfaction With Instructional Function

Perceived satisfaction with the instructional function was reported from question E. 1, with results as summarized in Table 58. Almost three-fourths of the respondents reported that they were satisfied or fairly well satisfied with their institute teaching function. Fewer than one-fourth indicated that they were dissatisfied or very dissatisfied with this function.

TABLE 58

DISTRIBUTION OF STAFF BY PERCEIVED SATISFACTION WITH INSTRUCTIONAL FUNCTION

Perceived Degree of Satisfaction	Responses f	%
Not Applicable	4	3.7
Satisfied	30	27.7
Fairly Well Satisfied	49	45.4
Somewhat Dissatisfied	17	15.8
Dissatisfied	7	6.5
Very Dissatisfied	1	0.9
Total	108	100.0

4.5.2 General Ambitions in Post Secondary Education

Role satisfaction and future career ambitions are briefly summarized by responses shown in Table 59. Almost all respondents (93.5 per cent) stated their wish to remain in post-secondary education activities. No attempt was made, however, to determine the type of post-secondary activity (college, institute, university) in which the respondents showed interest.

TABLE 59

DISTRIBUTION OF STAFF BY STATED AMBITIONS REGARDING POST-SECONDARY EDUCATION

Do You Wish To Remain in Post Secondary Education?	Responses f	%
Yes	101	93.5
No	3	2.8
Undecided	4	3.7
Total	108	100.0

4.5.3 Perceived Extent of Maintained Professional Engineering Contact

Perceptions of the extent of maintained professional engineering contact, and the ease with which staff could make the transition from the institutes into industry, are summarized in Tables 60 and 61.

One-sixth of the respondents believed that their professional engineering contact had been essentially lost, while another two-fifths believed that such contact was being lost rapidly.

TABLE 60

DISTRIBUTION OF STAFF BY PERCEIVED DEGREE OF MAINTAINED PROFESSIONAL ENGINEERING CONTACT

Perceived Degree of Maintained Contact	Responses f	%
Considerable Contact Maintained	43	39.8
Contact Being Lost Rapidly	47	43.5
Contact Essentially Lost	18	16.7
Total	108	100.0

Staff perceptions of the ease with which they could accomplish the employment transition from institute to industry are summarized in Table 61. One-half of the respondents claimed that such a transition could be easily accomplished, while the other half conceded that some difficulty would be associated with such a transition.

TABLE 61

DISTRIBUTION OF STAFF BY PERCEIVED EASE OF TRANSITION FROM INSTITUTE STAFF TO INDUSTRY

Perceived Ease of Transition	Responses f	%
Easily Accomplished	55	51.0
Accomplished with Difficulty	51	47.2
Practically Impossible to Accomplish	2	1.8
Total	108	100.0

Perceptions summarized in Tables 70 and 61 appear to indicate the views that, although professional engineering contact is being lost in many instances, enough contact remains that the staff could make the transition from the institutes into industry.

4.5.4 Industrial Employment Opportunities

In addition to being an index of maintained industrial contact by staff, the frequency of offered industrial employment opportunities also reflects the extent of staff interest in such employment.

During the year preceding this study, 31 employees (28.1 per cent of respondents) reported that they received explicit industrial employment offers. Only 15 staff reported that they seriously considered the industrial employment opportunities (Table 62).

TABLE 62

DISTRIBUTION OF STAFF BY INDUSTRIAL EMPLOYMENT OPPORTUNITIES

(a) Did You Receive An Explicit Industrial Employment Offer During the Past Year?	Responses f	%
Yes	31	28.7
No	77	71.3
Total	108	100.9

(b) Was Employment Offer in (a) Seriously Considered?	Responses f	%
Yes	15	48.3
No	16	51.7
Total	31	100.0

Of the 15 industrial employment opportunities reported as seriously considered, only one was accepted by a staff member who intended to complete the institute academic year before entering industry. Reported reasons for rejection of industrial employment opportunitics which had been seriously considercd were personal and geographic aspects and employment conditions (reported by 10, 1 and 3 staff, respectively).

4.5.5 Perceived Professional Role

Question E. 8 of the questionnaire intended to force the staff member to define his professional role, by determining whether he viewed himself as a professional engineer or a teacher/instructor. Reported responses were almost equally divided, with 55.5 per cent of the respondents perceiving themselves as professional engineers, and the remainder as teachers/instructors (Table 63). While maintained professional engineering contact is an important requirement of institute staff, the

identification of more than one half the respondents with professional engineering rather than education was perhaps indicative of important staff perceptions and committments.

Rourke and Brooks (1966) state that from the perspective of organizational theory, institutions of higher education belong in the category of professional organizations. That is, they are institutions whose staff ". . . includes a sizable percentage of highly trained employees in the form of faculty members who strongly identify with the skill they practice rather than the institution to which they are attached."

TABLE 63

DISTRIBUTION OF STAFF BY
PERCEIVED PROFESSIONAL CATEGORIZATION

Professional Category	Responses f	%
Professional Engineer	60	55.5
Teacher/Instructor	48	44.5
Total	108	100.0

4.5.6 Perceived Relative Importance of Staff Development Methods

Practically no need was perceived by respondents for staff development in pedagogic or general subject matter; rather, technical subject upgrading and industrial upgrading were perceived to be of importance equal to institute staff (Table 64).

Some inconsistency in response seemed apparent, when comparing perceptions reported in Table 64 with those in Table 42. In Article 4.3.3 f and Table 42, staff responses indicated that almost two-thirds of respondents believed

that industrial leave was a more desirable staff upgrading mechanism than was educational leave. Responses summarized in Table 64, however, indicated the perception that academic upgrading in technical subjects and industrial upgrading were of essentially equal value.

There was, probably, no inconsistency of perceptions as reported in Tables 42 and 64. While the term industrial upgrading was used in both questions C.3.8 and E. 2 with an apparently consistent definition and interpretation, there undoubtedly were differences in interpretation of the terms educational leave, as used in question C.3.8 and academic upgrading in technical subjects, as used in question E. 2. The latter term was intended to indicate staff development in technical subject expertise, while the former term was intended to describe a staff development mechanism of formal study which may or may not be intended to increase technical subject matter competence.

TABLE 64

DISTRIBUTION OF STAFF BY PERCEIVED RANKED IMPORTANCE OF VARIOUS STAFF DEVELOPMENT MECHANISMS

Staff Development Mechanism	Frequency of Perceived Ranked Importance				
	1st*	2nd	3rd	4th**	Total
Academic Upgrading in Technical Subjects	52	40	13	3	108
Academic Upgrading in Pedagogy	4	14	51	39	108
Academic Upgrading in General Subjects	6	7	37	58	108
Industrial Upgrading	46	47	7	8	108
Total	108	108	108	108	

* Most Important
** Least Important

CHAPTER 5

SUMMARY, IMPLICATIONS AND POSSIBLE EXTENSIONS

CHAPTER 5

SUMMARY, IMPLICATIONS, AND POSSIBLE EXTENSIONS

5.1 Summary

Valuable staff descriptive information resultant from this study are summarized below:

5.1.1 Age Characteristics - the median age of respondents was 34.5 years.

5.1.2 Duration of Institute Service - almost one-half the respondents had four years or less service at the institutes, and one-third had been on institute staffs for two years or less. The median value for the length of institute service was 4.6 years.

5.1.3 Professional Activity - Extensive nominal activity in the Association of Professional Engineers of Alberta was indicated by the observation that 89 per cent of the respondents were current association members. Limited real activity was, however, indicated by findings that

- only 2.4 per cent of respondents had served as elected association officers

- only 19.4 per cent of respondents had served on association committees

- only 4.2 per cent of respondents assessed their attendance at association meetings as "regular"

- barely one-half the respondents perceived association membership as "desirable" or "highly desirable".

5.1.4 <u>Education</u> - The majority of respondents (89 per cent) achieved professional status by means of university graduation, with approximately one-fourth of the graduates having proceeded to a graduate engineering degree. Two-thirds of the university graduates reported that their post-secondary education was wholly or primarily in Alberta.

Although almost all respondents viewed their education as adequate for the performance of their institute duties, almost one-third were enrolled in formal upgrading programs.

Slightly more than one-half of those involved in formal upgrading were enrolled in formal upgrading programs.

Slightly more than one-half of those involved in formal upgrading were engaged in graduate engineering study, with the remainder enrolled in upgrading to education or arts degrees.

Educational leave had been granted to almost one-fifth the respondents, to assist their upgrading.

The majority of staff had never held an Alberta Teaching Certificate.

5.1.5 Professional Experience

5.1.5 a. Professional Engineering Experience

Using the definition in Article 4.3.3, one-third of the respondents had insufficient professional engineering experience to be eligible for professional registration prior to joining the institute staffs.

Professional engineering experience reported ranged to 36 years, with a median value of 2.7 years. Almost one-half the staff possessed two years or less professional engineering experience prior to becoming institute employees.

Almost one-third of the respondents reported their professional engineering experience to be primarily in the governmental sector of endeavor.

Two-thirds of staff reported Alberta to be the geographic location of all or most of their professional engineering activity prior to institute employment.

Limited maintained professional engineering contact was reported, since institute employment; 78.7 per cent reported no such involvement during the year.

5.1.5 b. Teaching Experience

Some teaching experience prior to institute employment was claimed by 37 per cent of the respondents, although such experience was of diverse types.

5.1.5 c. Experience - General

The staff development mechanism of industrial leave was perceived by two-thirds of staff as more valuable than educational leave, for upgrading.

In excess of ninety per cent of the staff viewed their professional experience prior to institute employment

as at least adequate for the performance of their institute duties.

5.1.6 Conditions of Employment

5.1.6.a Work Load

Assigned weekly work loads for the line instructional group ranged up to 25 hours per week, with a median load of 18.8 hours per week. This same group reported total weekly work loads with a median value of 41.6 hours per week.

The junior administrative group (Senior Instructor - Section Head - Department Head) reported lower assigned work loads (11.1 hours per week median), and slightly higher total weekly work loads (43.2 hours per week median).

5.1.6. b Income

The median salary of the line instructional group was $10,520 per year, with the Senior Instructor - Section Head - Department Head group reporting a median of $13,050 per year.

Most respondents reported no additional income from other professional activities.

5.1.6. c Perceived Satisfaction and Ambitions

Almost three-fourths of the respondents reported that they were satisfied or fairly well satisfied with their teaching function, and almost all (93.5 per cent) expressed the wish to remain in post-secondary education activities.

5.1.7 Miscellaneous Aspects and Perceptions

Almost two-thirds of respondents perceived their professional engineering contact as being lost rapidly or essentially lost, but one-half believed that the transition from institute to industry could be easily accomplished.

Perceptions of the need for staff development and the development mechanisms were revealing in that:

a) virtually all respondents viewed their educational preparation as at least adequate for institute employment,

b) almost one-third of the staff were enrolled in a formal upgrading program,

c) two-thirds of the staff perceived industrial upgrading as more valuable than educational upgrading, although only 3.7 per cent of the respondents had investigated the possibility of pursuing industrial upgrading by applying for industrial leave from the institute.

5.2 Implications

While description and characterization of a staff group were the primary objectives of this study, there was also inference that emergent data could form the basis for future decision-making in aspects of recruitment, staff utilization and staff development.

It was not possible to compare findings of this investigation with accepted norms of significant staff characteristics, in view of the paucity of such quantitative norms. Undoubtedly, however, institute administrative staff have some perceptions of the staff characteristics which they view as desirable. Definitions of such norms, although perhaps subjective and qualitative at this stage, and comparison of measured characteristics thus form a basis for assessment of staff quality and generate implications for future administrative actions. The extent of inconsistency between the characteristics measured and those deemed desirable is the measure of the magnitude and urgency of resultant implications.

Each measured characteristic might define the direction for future administrative action in aspects of recruitment, staffing and staff development: conceivably at least, for example, might be the policy of defining desirable personal characteristics of the staff, in which case age and marital status might be of importance. It is more conceivable, however, that characteristics more explicitly related to job performance would be those of interest, in

which case the components of staff competence are of primary concern. Complexities associated with any direct assessment of competence result in the need to focus on indicators of competence, such as those treated in this study.

Thus of primary, most explicit importance are staff characteristics related to formal educational or industrial preparation, and industrial-professional experience, both possessed at commencement of employment and maintained. Primary implications emergent from this study therefore relate to these indices of staff competence.

Educational Preparation

Population definitions from this study were such that all respondents were necessarily eligible for registration as a professional engineer; such eligibility was attained by university graduation by 89 per cent of respondents, with the remaining 11 per cent having completed a program of self-study.

While possession of an undergraduate degree or equivalent might be perceived by institute administration as the desirable educational credential, explicit role definition is indicated. That is, the diversity of institute program offerings and organizational levels in which engineers are employed would tend to indicate

the need for a more variable system of educational credentials to be exhibited by this staff group. An undergraduate degree or professional registration might well be perceived by institute administration as excessive for some institute roles, and inadequate for others.

Professional Experience

In terms of definitions stated in Article 4.3.3, only two-thirds of respondents possessed professional engineering experience prior to institute employment sufficient for them to register with the professional association. The median of such experience was 2.7 years, with one-half of the respondents exhibiting two years or less professional experience prior to institute employment.

If institute administration concede that technical competence of staff obtained from professional education and experience is the staff characteristic of paramount importance, there might well be the need to examine the obtained data pertaining to experience possessed by staff when hired by the institute. That is, while the duration of professional experience is not the sole measure of the quality of industrial awareness of staff, it is the index most capable of definition

and control by institute administration.

In addition to the duration of possessed professional experience, other characteristics of experience might merit consideration. The finding that two-thirds of respondents had experience entirely or essentially entirely in Alberta requires a policy statement, before conversions into staff recruiting practice. From one perspective, such information describes a staff group with experience limited, in a geographic sense; conversely, however, this limited geographic exposure tends to indicate a staff group which should be sufficiently familiar with the Alberta professional/industrial setting that they can appropriately direct curriculum design and instruction to achieve the vocational objectives of the institutes.

The possession of essentially-governmental professional engineering experience of one-third of respondents also has implications for recruitment. Such preparation might or might not be tolerable, depending on the employment markets filled by institute graduates, and the orientation brought to programs by staff members.

Although exigencies of recruitment and public service constraints often prevent the institutes from attracting appropriately experienced staff, there must be the attempt by institute administrators to define explicitly and consistently the components of professional experience required of staff members.

Only after such definitions can the conditions of employment be adjusted in order to attract and retain the required professional staff.

Maintained Professional Activity

The extent to which staff maintained professional engineering activity was indicated by several groups of responses.

Although 89 per cent of respondents were current A.P.E.A. members, indicating a high level of nominal involvement with the provincial professional association, there was some evidence to indicate that real association activity was rather more limited. Only 2.4 per cent of staff had served as an A.P.E.A. elected officer, 19.4 per cent had served on an A.P.E.A. committee and only 4.2 per cent viewed their attendance at A.P.E.A. meetings as regular. Three-fourths of the staff conceded some desirability in the maintenance of association membership, however. Collectively,

these responses appear to describe a staff group nominally committed to the value of membership in a professional association, while truly active to a very limited extent. Implications emerge for A.P.E.A., if this association is to structure its objectives and operations so as to gain support of a group of salaried public service engineers such as those described in this investigation.

Professional engineering activity while on institute staffs was reported during the summer vacation period and throughout the academic year. Three-fourths of the respondents had no summer employment activity and four-fifths reported no professional involvement during the academic year. The extent of professional involvement via these two mechanisms appears minimal, and perhaps inconsistent with the stated institute administration goal of maintained professional contact.

Despite the apparently minimal maintained professional contact, one-half of the respondents believed that they could easily make the transition from the institutes into industry.

Staff Development

The two major formalized staff development mechanisms of educational leave and industrial leave were investigated, in addition to some staff perceptions of the comparative effectiveness of the two methods.

Perceptions of the relative importance of educational and industrial upgrading were not reflected in staff development practice.

Reported staff perceptions indicate that industrial leave should be more desirable than educational leave, but the limited data available do not support this priority. Undoubtedly, the apparent inconsistency is related to the salary grid in effect at the institutes, in which educational upgrading is directly reflected by salary increases. Industrial leave, on the other hand, has no direct economic benefit, with the staff member receiving virtually the same salary after returning from industrial leave as when he left the institute.

Reiteration of institute policy regarding the educational and industrial competence of staff might indicate the need to adjust the salary grid so that appropriate and equitable financial recognition accompanies staff development via industrial leave.

The initiation of staff development might warrant examination. Precedent requires that initiation of a request for educational or industrial leave is from the staff member, with institute administration responding to the request. It might be more appropriate, in terms of organizational goals, to have staff upgrading requests originated by the institute administration; in such a manner, the limited staff development resources could be directed to the organizational units and staff exhibiting greatest need for development.

The purposes of educational leave might be examined, in terms of stated institutional goals and priorities. Of the granted educational leaves, for example, approximately 60 per cent were for graduate

study in engineering, with the remainder directed to undergraduate and graduate study in education.

The need for explicit role definition of staff is again apparent, so that components of staff competence can be emphasized and developed to the required levels. Conceivably, institute policy might define the undergraduate degree in a subject specialty as the necessary staff prerequisite, after which formal educational upgrading might be directed to pedagogy, elements of technical-vocational education, or liberal education.

Related to any analysis of staff credentials and staff development is examination of the basic institute policy, reflected by the salary grid, of staff remuneration on the basis of educational credentials possessed. The viability of such a concept is questionable on several bases, but is particularly in doubt in an educational system in which administrators reiterate the importance of industrial work experience. Watson (1971) noted that there was a high incidence of formal educational upgrading in Alberta technical institutes, interpreted

as directly attributable to incentives in the salary schedule. It is possible to speculate that a salary system based on the role to be performed rather than upon credentials of an incumbent, would be reflected by staff upgrading activity, particularly in formal educational aspects, more realistic and consistent, in terms of organizational and industrial interests and requirements.

Conditions of Employment

Implications for conditions of employment do not emerge solely from this investigation. Such aspects can be viewed in perspective only by assessment of factors such as organizational climate and staff morale, rate of staff turnover, the number and quality of applicants for positions, and continued study of employment conditions in similar institutions and systems.

Almost three-fourths of the respondents reported that they were satisfied or fairly well satisfied with the instructional function, and 93.5 per cent stated their wish to remain in post-secondary education activities.

While concern is commonly expressed if staff turnover rates are in excess of accepted norms, abnormally-low rates are also indices of organizational distress.

Implications - Summary

Integration of data pertaining to (a) industrial experience prior to institute employment, (b) degree of maintained industrial/professional contact, and (c) involvement in staff development, might define a staff group whose characteristics are inconsistent with those viewed as desirable by institute administrators.

Emergence of such inconsistencies has the broad administrative implications:

(a) the need to state explicitly the role definitions for the staff members,

(b) the need to modify recruitment and selection procedures to more completely ensure that selected staff can fulfill the role definitions (a),

(c) the encouragement of more extensive meaningful professional/industrial contact by staff,

(d) the design of staff development mechanisms to fulfill recognized personal and organizational needs, and

(e) the need to modify organizational inducements (salary schedule, promotion system) in a manner so as to realistically reflect the maintenance of staff competence via (c) and (d), and in order to attract staff capable of fulfilling defined role requirements.

5.3 Extensions of the Study

Insofar that this investigation attempted to characterize a staff group at one time in the development of an educational system, extensions of the study might include:

1. replications of the study to other staff segments, such as the health-related and business-related groups,

2. replications of the study to the professional engineering group, in the attempt to detect significant trends with time of any measured characteristic,

3. in-depth study of staff development mechanisms, including
   - costs and allocation of resources
   - emphasis assumed by various development mechanisms
   - apparent effectiveness of development, in terms of career mobility of staff assisted

4. in-depth study attempting to correlate selected staff characteristics and the organizational/professional "success" of the staff members.

5. application of instruments to the measurement of organizational climate, staff morale and leadership behavior,

6. redefinition of institute salary schedules, to reflect equitably and consistently the staff characteristics claimed desirable by institute administrators.

7. definition of staff characteristics necessary and desirable for the performance of institute roles.

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APPENDIX "A"

LETTER FROM ALBERTA COLLEGES COMMISSION
TO INSTITUTE PRESIDENTS

27 January, 1970

January 26, 1970.

Mr. F.C. Jorgenson, President,
Southern Alberta Institute of
Technology,
Calgary, Alberta.

Dear Mr. Jorgenson:

A graduate student in the Department of Educational Administration at the University of Alberta, Mr. Fred Williamson, recently discussed with me his research project. Mr. Williamson is planning to examine the role of the professional engineer in technical education. I think the findings of his survey might provide those responsible for the administration of non-university post-secondary education institutions in this Province with much valuable information. Consequently, I endorse the project, and hope that your staff will find time to participate in the study.

Since there are only two major institutions in Alberta offering technical education, it is almost a necessity that both NAIT and SAIT provide access to Mr. Williamson if he is to proceed with the research. He tells me that the administration of the instrument will involve some time with Division and Department Heads, but that the President and his immediate assistants will really not become directly involved at all.

It would be much appreciated, therefore, if your institution would be prepared to accommodate Mr. Williamson.

Thank you.

Sincerely,

R.G. Fast,
Director of Instructional
Services,
Alberta Colleges Commission.

c.c. Mr. J.P. Mitchell.

APPENDIX "B"

COVERING LETTER FOR QUESTIONNAIRE
REQUESTING STAFF COOPERATION

March, 1970

Department of Educational
Administration
University of Alberta
March, 1970

I am a N.A.I.T. staff member, presently on Educational Leave in pursuit of the degree of Master of Education in Educational Administration at the University of Alberta. In fulfillment of the degree thesis requirement, I have undertaken a study of the role of professional engineers in Alberta Technical Education.

Such a study, approved by Dr. Kolesar of the Alberta Colleges Commissions and the two Institute Presidents, is essentially descriptive in nature, and attempts to characterize instructional and administrative staff whose backgrounds are in professional engineering. Although in-depth knowledge of <u>all</u> institute staff is ultimately desirable, the choice of this study group is based upon:

a) the significant contributions rendered by staff with engineering backgrounds,

b) the workable sample size, and

c) the personal interests of the writer.

Data obtained will, of course, be available to interested individuals and staff groups and may, indeed, have implications in hiring practice, job descriptions, staff upgrading and in-service education.

Will you be so kind as to complete the attached questionnaire? Your efforts in attaining a high level of response are sincerely appreciated.

Yours truly,

F. Williamson, P. Eng.
6411 - 150 Avenue
Edmonton 32, Alberta

FW:pb

APPENDIX "C"

STAFF QUESTIONNAIRE

S T A F F   Q U E S T I O N N A I R E

INSTRUCTIONS TO RESPONDENTS

1. Please read these instructions completely before starting to answer the questionnaire.

2. Do not place your name on the questionnaire.

3. Please attempt to answer all questions.

4. If you are unable to select a suitable response, a brief comment near the question will be appreciated.

5. Please place the completed questionnaire in the attached, addressed envelope and mail it.

STAFF QUESTIONNAIRE

A. POSITION AND INSTITUTE

A.1 Position Held ....

A.2 Department ....

A.3 Division ....

A.4 Institute ....

A.5 Date hired onto Institute Staff ....

A.6 Approximate dates of promotions or transfers within the Institutes:

to Senior Instructor ....
to Section Head ....
to Department Head ....
to Divisional Director ....
other (please specify) ....

A.7 What is your present instructor rating? (please check one)

Instructor III ....
Instructor IV ....
Instructor V ....
Not applicable ....

B. PERSONAL DATA

B.1 Age in years as of January 1, 1970 ....

B.2 Sex: male .... female ....

B.3 Marital Status: (please check one)

single ...... married ...... other ....

B.4 How many children do you have? (please check one)

none ...... 1...... 2...... 3...... 4......

more than 4...... not applicable......

C. PROFESSIONAL AFFILIATION, EDUCATION, AND PROFESSIONAL EXPERIENCE

C.1 PROFESSIONAL AFFILIATION

C.1.1 Membership status in the Association of Professional Engineers of Alberta:

never a member ....
presently a member; since ....
a former member; from .... to ....
an Engineer in Training; since ....

C.1.2 If formerly or presently a member, membership was achieved by: (please check one)

university graduation plus experience ....
Association examinations ....

C.1.3 If presently a member, do you attend Association meetings: (please check one)

regularly? ....
occasionally?..............
seldom? ....
never? ....

C.1.4 If formerly or presently a member, have you ever served on an Association committee? (please check one)

YES .... NO ....

C.1.5 If answer to question C.1.4 is "yes", date of last committee service:

from .... to ....

C.1.6 If answer to question C.1.4 is "yes", names of committees on which you served:

....

....

....

C.1.7 If formerly or presently a member, have you ever served in the capacity of an elected officer? (please check one)

YES .... NO ....

C.1.8 If answer to question C.1.7 is 'yes', please list positions held, and their dates:

position	date
....	....
....	....
....	....
....	....

C.1.9 If eligible for Association membership, but not a member, reason for not being a member is: (please check one)

financial ....
other (please specify)..............
not applicable ....

C.1.10 Please list other professional associations to which you presently belong: (For example, other provincial Associations, E.I.C., etc.)

....
....
....
....
....
....
....

C.1.11 Do the view the maintenance of membership as a condition of employment? (please check one)

YES ....   NO ....

C.1.12 Do you view the maintenance of membership in A.P.E.A. as: (please check one)

highly desirable ....
desirable ....
of limited value ....
of questionable value ....
of no apparent value ....

C.1.13 Are you a member of the Association of Technical Instructors of Alberta? (please check one)

YES ....   NO ....

C.1.14 Are you a member of the Civil Service Association of Alberta? (please check one)

YES ....   NO ....

C.2 EDUCATION

C.2.1 Please indicate your highest level of completed academic education, and the date completed:

highest level ....
date completed ....

C.2.2 Please indicate the field of engineering in which education was obtained, by checking one of the following types: if educated in more than one field, please indicate the types, and note which one is primary.

civil .... mechanical.........
electrical .... mining ....
metallurgical .... aeronautical ....
chemical-petroleum .... other ....

C.2.3 Please state the number of years of full-time, post-secondary study required to achieve the highest academic attainment cited in question C.2.1. .... years

C.2.4 Total number of years of part-time, post-secondary study required to achieve highest academic attainment cited in question C.2.1.

.... years

C.2.5 Where was your post-secondary education obtained? (please check one)

all in Alberta ....
largest part in Alberta ....
all in Canadian province other than Alberta ....
largest part in Canadian provinces other than Alberta ....
largest part in the U.S.A. ....
largest part in Continental Europe (name country)............................
largest part in British Isles................
largest part elsewhere (name country)............................

C.2.6 Are you presently enrolled in a program of studies to improve your credentials? (please check one).

YES .... NO...............

C.2.7 If answer to question C.2.6 is "yes", please name program, and degree/certificate/diploma sought.

program ....
degree/diploma/certificate sought...........

C.2.8 Since joining the Institute staff: (please check one response to each)

(a) have you applied for Educational Leave? yes.......... no ....
(b) have you been granted Educational Leave? yes........... no ....
(c) if "yes", please indicate:
when:..................................
for what purpose? ....
....

C.2.9 With regard to an Alberta Teaching Certificate: (please check one)

I have never held a teaching certificate.....
My first teaching certificate was obtained in Alberta ....
My first teaching certificate was obtained in another province ....
My first teaching certificate was obtained in another country....................
(please name country)............

C.2.10 Generally, for the performance of your Institute duties, do you view your educational credentials as: (please check one)

excessive ....
adequate ....
inadequate ....

C.3 PROFESSIONAL EXPERIENCE

C.3.1 In what field of engineering did you obtain most of your professional experience, prior to coming to the Institute? (please indicate "1", "2", etc. in order of priority, if experience obtained in more than one field)

civil.......... mechanical ....
electrical .... mining ....
metallurgical .... aeronautical ....
chemical-petroleum............
other (please specify)..............

C.3.2 Where was most of your engineering experience obtained, prior to coming to the Institute? (please check one)

all in Alberta ....
largest part in Alberta ....
all in Canadian province other than Alberta.....................
largest part in the U.S.A. ....
largest part elsewhere......................
(name country)..............

C.3.3 What is the total extent of your full-time, professional experience (after achieving professional status, and prior to joining the Institute staff)?

.... years

C.3.4 Would you categorize your professional experience (prior to joining the Institute staff) as primarily: (Please check one answer in each category).

(i) (a) governmental
federal ......
provincial ....
civic ....
other ....

or

(i) (b) private ....

(ii) design ....
contracting/construction....................
inspection..................................
materials control...........................
consulting ....
other (please specify) ....

C.3.5 Using the Canadian Council of Professional Engineers guideline (attached), what professional level did you occupy immediately prior to joining the Institute staff?

level ....

C.3.6 Since joining the Institute staff, to what extent have you been involved in engineering activities?

(a) during summer vacation (please indicate the number of summers during which you have performed engineering work)........

(b) during the academic year (indicate the approximate number of hours per week spent, other than on Institute-related duties) .... hours per week

C.3.7 Since joining the Institute staff: (please check one response to each)

(a) have you applied for industrial leave? yes........ no........

(b) have you been granted industrial leave? yes........ no........

(c) if "yes", please indicate:
when:.........................
for what purpose?.............

C.3.8 Do you view industrial leave as preferable to educational leave? (please check one)

YES............... NO...............

C.3.9 Generally, for the performance of your Institute duties, do you view your professional experience as: (please check one)

excessive ....
adequate ....
inadequate ....

C.3.10 Did you possess teaching experience prior to joining Institute staff? (please check one)

YES............... NO..............

C.3.11 If answer to question C.3.10 is "yes", please indicate number of years teaching experience.....

where obtained..............................
when obtained...............................
type of educational institution involved.....
....

D. CONDITIONS OF EMPLOYMENT

D.1 During the present academic year, what is your assigned teaching load (that is, the average of all quarters)?

lecture hours per week ....
laboratory hours per week ....
total assigned hours per week ....
not applicable (please check).............

D.2 What do you estimate to be your average weekly work load connected with your (day-time) Institute employment? .... hours per week

D.3 During the present academic year, are you (or have you been) involved in teaching Extension Division courses?

YES............. NO.............

D.4 What is your approximate yearly salary and income· (please check one response to each question)

(a) as a full-time Institute employee (exclusive of Extension Division duties)

less than $6,000 ....
$ 6,000 to $ 6,999 ....
$ 7,000 to $ 7,999 ....
$ 8,000 to $ 8,999 ....
$ 9,000 to $ 9,999 ....
$10,000 to $10,999 ....
$11,000 to $11,999 ....
$12,000 to $12,999 ....
$13,000 to $13,999 ....
$14,000 to $14,999 ....
over $15,000 ....

(b) from Extension Division (teaching) duties:

No income ....
less than $500 ....
$ 500 to $ 999 ....
$1000 to $1499 ....
more than $1500 ....

(c) from other professional engineering services:

No income ....
less than $500 ....
$ 500 to $ 999 ....
$1000 to $1499 ....
$1500 to $1999 ....
more than $2000 ....

E. PROFESSIONAL AMBITIONS, MISCELLANEOUS

E.1 Do you wish to remain in the field of post-secondary education? (please check one)

YES............. NO.............

E.2 Upgrading (formal and informal) is expected of Institute staff: how do you assess the relative importance of the following possible types of upgrading? (please rank as '1', '2', '3', etc.)

.... academic upgrading in a technical subject field
.... academic upgrading in pedagogy
.... academic upgrading in general education subject areas
.... industrial upgrading
.... other - please specify..............
....

E.3 During the past academic year, have you received explicit industrial offers of full-time employment? (please check one)

YES............. NO.............

E.4 If answer to question E.3 is 'yes', did you seriously consider leaving the Institute staff? (please check one)

YES............. NO.............

E.5 If you received an offer of full-time employment and rejected it, the reason for the rejection was primarily:

.... financial
.... personal
.... geographic
.... employment conditions
.... others (please specify)

E.6 If you are involved in the teaching function, how well satisfied are you will all aspects of your teaching situation? (please check one)

.... not applicable
.... satisfied
.... fairly well satisfied
.... somewhat dissatisfied
.... dissatisfied
.... very dissatisfied

E.7 How do you assess the degree to which you have maintained contact with the engineering profession, since joining Institute staff? (please check one)

.... considerable contact maintained
.... contact being lost rapidly
.... contact essentially lost

E.8 If (for some reason) you were to return to industry, would you expect the transition to be (please check one)

.... easily accomplished
.... accomplished with difficulty
.... practically impossible to accomplish

E.9 If required to categorize yourself into a <u>single</u> profession, do you view yourself as essentially: (please check one)

.... a professional engineer
.... a teacher/instructor

E.10 Additional comments pertaining to your Institute and professional engineering roles.

____

____

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CLASSIFICATION GUIDE OF LEVELS
OF ENGINEERING RESPONSIBILITY

(for use in response to question C.3.5)

DEFINITIONS OF RESPONSIBILITY LEVELS

LEVEL A

Duties

Receives training in the various phases of office, plant, field or laboratory engineering work as classroom instruction or "on-the-job" assignments. Tasks assigned include: preparation of simple plans, designs, calculations, costs and bills of material in accordance with established codes, standards, drawings or other specifications. May carry out routine technical surveys or inspections and prepare reports.

Recommendations, Decisions & Commitments

Few technical decisions called for and these will be of routine nature with ample precedent or clearly defined procedures as guidance.

Supervision Received

Works under close supervision. Work is reviewed for accuracy and adequacy and conformance with prescribed procedures.

Leadership Authority, Supervision Exercised

May assign and check work of one to five technicians or helpers.

Guide to Entrance Qualifications

Bachelor's degree in Engineering, or Applied Science, or its equivalent(1) with little or no practical experience.

LEVEL B

Duties

Normally regarded as a continuing portion of an engineer's training and development.

Receives assignments of limited scope and complexity, usually minor phases of broader assignments. Uses a variety of standard engineering methods and techniques in solving problems. Assists more senior engineers in carrying out technical tasks requiring accuracy in calculations, completeness of data and adherence to prescribed testing analysis, design or computation methods.

Recommendations, Decisions & Commitments

Recommendations limited to solution of the problem rather than end results. Decisions made are normally within established guide lines.

Supervision Received

Duties are assigned with detailed oral and occasionally written instructions, as to methods and procedures to be followed. Results are usually reviewed in detail and technical guidance is usually available.

Leadership Authority, Supervision Exercised

May give technical guidance to one or two junior engineers, or technicians, assigned to work on a common project.

Guide to Entrance Qualifications

Bachelor's degree in Engineering, or Applied Science, or its equivalent(1), normally with two to three years working experience from the graduation level.

LEVEL C

Duties

This is typically regarded as a fully qualified professional engineering level. Carries out responsible and varied engineering assignments, requiring general familiarity with a broad field of engineering and knowledge of reciprocal effects of the work upon other fields. Problems usually solved by use of combinations of standard procedures, modification of standard procedures, or method developed in previous assignments. Participates in planning to achieve prescribed objectives.

Recommendations, Decisions & Commitments

Makes independent studies, analyses, interpretations and conclusions. Difficult, complex or unusual matters or decisions are usually referred to more senior authority.

Supervision Received

Work is not generally supervised in detail and amount of supervision varies depending upon the assignment. Usually technical guidance is available to review work programs and advise on unusual features of assignment.

Leadership Authority, Supervision Exercised

May give technical guidance to engineers of less standing, or technicians assigned to work on a common project. Supervision over other engineers not usually a regular or continuing responsibility.

Guide to Entrance Qualifications

Bachelor's degree in Engineering, or Applied Science, or its equivalent(1), normally with three to five years related working experience from the graduation level.

LEVEL D

Duties

This is the first level of direct and sustained supervision of other professional engineers OR the first level of full specialization. Requires application of mature engineering knowledge in planning and conducting projects having scope for independent accomplishments and co-ordination of the difficult and responsible assignments. Assigned problems make it necessary to modify established guides, devise new approaches, apply existing criteria in new manners, and draw conclusions from comparative situations.

Recommendations, Decisions & Commitments

Recommendations reviewed for soundness of judgment but usually accepted as technically accurate and feasible.

Supervision Received

Work is assigned in terms of objectives, relative priorities and critical areas that impinge on work of other units. Work is carried out within broad guide lines, but informed guidance is available.

Leadership Authority, Supervision Exercised

Assigns and outlines work; advises on technical problems; reviews work for technical accuracy, and adequacy. Supervision may call for recommendations concerning selection, training, rating and discipline of staff.

Guide to Entrance Qualifications

Bachelor's degree in Engineering, or Applied Science, or its equivalent(1), normally with five to eight years of experience in the field of specialization from the graduation level.

LEVEL E

Duties

Usually requires knowledge of more than one field of engineering OR performance by an engineering specialist in a particular field of engineering. Participates in short and long range planning; makes independent decisions on work methods and procedures within an overall program. Originality and ingenuity are required for devising practical and economical solutions to problems. May supervise large groups containing both professional and non-professional staff; OR may exercise authority over a small group of highly qualified professional personnel engaged in complex technical applications.

Recommendations, Decisions & Commitments

Makes responsible decisions not usually subject to technical review, on all matters assigned except those involving large sums of money or long range objectives. Takes courses of action necessary to expedite the successful accomplishment of assigned projects.

Supervision Received

Work is assigned only in terms of broad objectives to be accomplished and is reviewed for policy, soundness of approach and general effectiveness.

Leadership Authority, Supervision Exercised

Outlines more difficult problems and methods of approach. Co-ordinates work programs and directs use of equipment and material. Generally makes recommendations as to the selection, training, discipline, and remuneration of staff.

Guide to Entrance Qualifications

Bachelor's degree in Engineering or Applied Science, or its equivalent(1), normally with nine to twelve years of engineering, and/or administrative experience from the graduation level.

LEVEL F

Duties

Usually responsible for an engineering administrative function, directing several professional and other groups engaged in inter-related engineering responsibilities; OR as an engineering consultant, achieving recognition as an authority in an engineering field of major importance to the organization.

Independently conceives programs and problems to be investigated. Participates in discussions determining basic operating policies, devising ways of reaching program objectives in the most economical manner and of meeting any unusual conditions affecting work progress.

Recommendations, Decisions & Commitments

Makes responsible decisions on all matters, including the establishment of policies and expenditures of large sums of money and/or implementation of major programs, subject only to overall company policy and financial controls.

Supervision Received

Receives administrative direction based on organization policies and objectives. Work is reviewed to ensure conformity with policy and co-ordination with other functions.

Leadership Authority, Supervision Exercised

Reviews and evaluates technical work; selects, schedules, and co-ordinates to attain program objectives; and/or as an administrator, makes decisions concerning selection, training, rating, discipline and remuneration of staff.

Guide to Entrance Qualifications

Bachelor's degree in Engineering, or Applied Science, or its equivalent(1), with broad engineering experience, including responsible administrative duties.

BEYOND LEVEL F

Duties

Within the framework of general policy, conceives independent programs and problems to be investigated. Plans or approves projects requiring the expenditure of a considerable amount of manpower and financial investment. Determines basic operating policies, and solves primary problems or programs to accomplish objectives in the most economical manner to meet any unusual condition.

Recommendations, Decisions & Commitments

Responsible for longe range planning, co-ordination, and making specific and far reaching management decisions. Keeps his management associates informed of all matters of significant importance.

Supervision Received

Operates with broad management authority, receiving virtually no technical guidance and control; limited only by general objectives and policies of the organization.

Leadership Authority, Supervision Exercised

Gives administrative direction to subordinate supervision and contact with the work force is normally through such levels rather than direct.

Guide to Entrance Qualifications

Bachelor's degree in Engineering, or Applied Science, or its equivalent with many years authoritative engineering and administrative experience. The incumbent is expected to possess a high degree of originality, skill and proficiency in the various broad phases of engineering application.

Alberta

(1) As recognized by the Association~~s~~ listed herein.

APPENDIX "D"

FOLLOW-UP LETTER TO STAFF
REQUESTING THEIR ASSISTANCE

May, 1970

Department of Educational
Administration
University of Alberta
May, 1970

In connection with my Master of Education thesis, I recently requested your cooperation in the completion of a questionnaire, the purpose of which was the study of the role of Professional Engineers in Alberta Technical Education.

Response has been quite gratifying, in view of the imminent completion of the Institute's academic year, and the resulting increase in your duties. If, however, you have been unable to respond, I would sincerely appreciate your assisting me to obtain the largest possible sample.

If you have already responded, please accept my thanks.

Yours truly,

F. Williamson, P. Eng.
6411 - 150 Avenue
Edmonton 32, Alberta